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ADVERTISEMENT FOR BIDS

Sealed bids will be received by the Manager, Improvements and Parks, of the City and County of Denver, in the State of Colorado, in the Council Chamber, Room 450, City and County Building, West Colfax Avenue and Bannock Street, until 2:00 o'clock P. M. (Mountain Standard Time) of August 5, 1949, for the construction of a building to be known as THE DENVER MUNICIPAL STADIUM, at which time and place the bids will be publicly opened and read aloud. The proposed building will be located at 44th Street and 46th Avenue, Denver, Colorado. All bids must be made on the Bid Form furnished with the Contract Documents. Bids received after closing time will be returned unopened.

Plans and Specifications and other proposed Contract Documents are on file at the following offices:

Office of Roland L. Linder, Architect, 507 Insurance Building, Denver, Colorado

Offices of Roberts and Schaefer Company, Lorimer and Rose, Associated Engineers and Architects, 130 North Wells Street, Chicago 6, Illinois, and 254 West 54th Street, New York 19, New York

Separate bids will be taken for each of the following proposed contracts; in addition a combined bid will be taken for proposed Contracts Nos. 2 and 3:

Contract No. 1. General Construction Work

Contract No. 2. Heating, Ventilating and Air Conditioning

Contract No. 3. Plumbing and Fire Protection

Contract No. 4. Electrical Power and Lighting

Contract No. 5. Ice Rink, Complete, Including Refrigeration and Ice Rink Floor Construction

Contract No. 6. Wells and Pumping Equipment

A set of Plans and Specifications and other Contract Documents may be obtained from the office of Roland L. Linder, Architect, 507 Insurance Building, Denver, Colorado. A set of Contract Documents covering Contract No. 1 will be furnished upon deposit of One Hundred Dollars (\$100.00) per set; and for other Contracts upon deposit of Fifty Dollars (\$50.00) per set. Deposits will be refunded to bidders upon return of Documents in good condition within ten days after receipt of bids. Additional sets which contractors may obtain for the cost of reproduction must be returned within the same time limit without refund. All Documents remain the property of the Engineers and Architects and must be returned within ten days after receipt of bids.

The character and amount of security to be furnished by each bidder are stated in th Information for Bidders in the above-mentioned Contract Documents. Any bid bond shall be countersigned by a resident agent residing in Colorado. No bid may be withdrawn for at least thirty days after the scheduled closing time for the receipt of bids.

Preference is hereby given to materials, supplies and provisions, produced, manufactured or grown in Colorado, the quality being equal to articles offered by competitors outside of the state.

The City and County of Denver, Colorado, reserves the right to reject any or all bids and to waive formalities as its best interests may dictate.

For The City and County of Denver

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INSTRUCTIONS TO BIDDERS

1. INTERPRETATION OF DOCUMENTS

If any person contemplating submitting a bid for the proposed Contract is in doubt as to the meaning of any part of plans, specifications, or other proposed Contract Documents, he may submit to Mr. Richard Bennetts, Coordinator of Construction, City and County of Denver, Room 420, Municipal Building, Denver, Colorado, a written request for an interpretation thereof, prior to forty-eight hours of the hour of opening of bids. The person submitting the request will be responsible for its prompt delivery. Any interpretation of the proposed Documents will be made only by Addendum duly issued and a copy of such Addendum will be mailed or delivered to each person receiving a set of such Documents. The City and County of Denver will not

2. PREPARATION OF BIDS

Bidders are required to use the Bid Form attached to and made a part of the Contract Documents. Each bidder is required to bid on all alternates pertaining to the contract concerned. Signed bids must not be detached from the other documents bound therewith. All bids from any one bidder may be entered in one bound set of documents.

3. BID SECURITY

Each Base Bid must be accompanied by a certified check, cashier's check, or bid bond acceptable to the City and County of Denver in an amount equal to at least 5% of the proposal, payable without condition to the City and County of Denver as a guarantee that the Bidder, if awarded the Contract, will promptly execute such Contract in accordance with the proposal and in manner and form required by the Contract Documents, and will furnish good and sufficient bond for the faithful performance of the same. The bid security of at least the three lowest bidders for each proposed contract will be retained until the Contract is awarded or other disposition is made thereof. The bid security of other bidders will be returned promptly after the opening of the bids. If the contract is awarded, the bid security of the successful bidder will be retained until he furnishes a surety bond for the faithful performance of the work in the manner and form prescribed in the General Conditions Governing All Contracts.

4. WITHDRAWAL OF BID

A bidder may not withdraw his bid before the expiration of thirty (30) days after the date of the opening of bids; thereafter a bidder may withdraw his bid only in writing and in advance of an actual award.

5. REJECTION AND WAIVER

The City and County of Denver reserves the right to reject any and all bids whenever deemed in its best interests, and also the right to waive any formalities in a bid.

6. CONSIDERATION OF BIDS

Bidders may submit bids for one or more contracts. Each bid will be given separate consideration, except that the City and County of Denver reserves the right to consider bids for Contracts 2 and 3 separately or combined.

7. FORM OF AGREEMENT

The form of contract required to be used and to be signed by the City and County of Denver and Contractors will be similar to the standard form of Contract as used and adopted by the City and County of Denver. A sample of contract will be made available to the Contractors during the bidding period.

TAINE MALOTIFA FOR CONTRACT

The entire project must be completed within four hundred twenty-five (425) calendar days from the day of award of contracts. Contractor No. 1, within thirty (30) days of authorization to proceed, will present a progress schedule for the approval of the Architect-Engineer, and this progress schedule, when approved, will immediately be made available for information of Contractors Nos. 2 to 6, inclusive.

9. LIQUIDATION OF BID SECURITY

If a Contractor's bid is accepted, the Contractor shall enter into a contract and furnish a satisfactory bond within ten (10) days from the date of mailing of notice by the Owner to the Contractor at the address given in the bid, which notice shall state that the contract is ready for signature.

If the Contractor fails to enter into a contract, the Owner may, at his option, declare that the Contractor has abandoned the contract. The bid security, at Owner's option, will become the property of the City and County of Denver, in the event the contract and bond are not executed within the time above set forth, as liquidated damages for the delay and additional cost thereof.

10. Wherever reference is made to the General Contractor, this is understood to mean Contractor for Contract No. 1.

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The City and County of Denver DEPARTMENT OF PARKS

	
BID FOR FURNISHING	•
All Labor and Material Necessary and Re	equired For:
Mandaine 1 Stedium	//+h Ctmost and
The erection of the Denver Municipal Stadium, 26th Avenue.	446H Stragt and
	· · · · · · · · · · · · · · · · · · ·
No. 1 (), 2 (), 3 (), 2 and 3 (),4(),5(),6
(Place "x's" in applicable spaces)	B
(A) of Bidder	
Bidder is: Individual () Partnership ((Place an "x" in applicable space)) Corporation ()
(Fiade an "X" in applicable space)	
Residence of Bidder (If Individual)	
Place of Business of Bidder	
Date of Bid	
(If bidder is a partnership, fill in t	he following blanks:)
Names of Partners	lesidence of Partners
(If bidder is a corporation, fill in t	he following blanks:)
Organized under the laws of the State of	
Name and Home Address of President	

Name and Home Address of Secretary

Name and Home Address of Treasurer

The above-named bidder affirms and declares:

- 1. The said bidder is of lawful age and the only one interested in this bid; and that no person, firm or corporation other than herein above named has any interest in this bid, or in the contract proposed to be taken.
- 2. That this bid is made without any connection with any other person, firm or corporation making a bid for the same work, and is in all respects fair, and without collusion or fraud.
- 3. That said bidder is not in arrears to The City and County of Denver on any debt or contract, and is not a defaulter, as surety or otherwise, on any obligation to the City and County of Denver.
- Work and has carefully examined the contract and will execute the contract and perform all its terms, covenants and conditions, and will provide, furnish and deliver all the labor, materials, supplies, tools and appliances necessary or required for the hereinbefore named work, all in strict conformity with the contract, in accordance with the following prices:-

BAS	E BID	FOR	CONTRACT	NO.	1	 GENERAL	CONSTRUCTION	
the	sum	o						
								
							Dollars (\$) .

DEDUCTIBLE ALTERNATE NO. 1 - CONTRACT NO. 1

If the Illuminated in Section No. 21 is el Base Bid the sum of	Marquee sign, framing liminated, there shall	and soffit as specified be deducted from the
vase Sig the sum of		

Dollars (

D 00099

	CTIBLE ALTERNATE NO. 2 - CONTRACT NO. 1	
are	If the Removable Barriers as specified in Section No. 2 eliminated, there shall be deducted from the Base Bid t	2 he
sum	of	
	Dollars (3).
35	FIREFIALTERNATE NOT 3 - CONTRACT NO. 12 If Wood Bar Sash are substituted for Aluminum Bar Sash efined under Section 10 - CARPENTRY, MILLWORK, ETC., the be deducted from the Pase 31d the sum of	ere
	Dollars (\$	
DE DE	CTIBLE ALTERNATE NO. 4 - CONTRACT NO. 1 If well pits and miscellaneous metal accessories for),
DE D	CTIBLE ALTERNATE NO. 4 - CONTRACT NO. 1),

12.42

DEDUCTIBLE ALTERNATE NO. 5 - CONTRACT NO.	DEDUCTIBLE	ALTERNATE	NO.	5	-	CONTRACT	NO.	1
-------------------------------------------	------------	-----------	-----	---	---	----------	-----	---

No.	If well pits and miscellaneous metal and No. 2, and guard rails for we omitted, there shall be deducted from	ells No. 3 and No. 4	ls
sum	of	<u>, </u>	
		_ Dollars (\$	<u> </u>

In computing the Base Bid the Bidder shall determine all quantities from lines and grades shown on the drawings.

In the event that changes in feeting elevations are authorized, additions to er deductions from the Base Bid shall be computed by means of unit prices applied to net differences in quantities as follows:

Item	Unit Price	Nnit
Concrete		C.Y.
Reinforcing		16.
Formwork		S.F. contact area
Excavation	***************************************	G.T.

The Unit Prices stated above by the Bidder shall include all overhead and profit.

In the event that substantial differences in quintities of general excavation, backfilling and grading are required because of the nature of subsurface materials encountered amount shall be added to or deducted from the Basis The amount shall be determined by negotiation.

Adendum #1 THE CITY AND COUNTY OF DENVER STATE OF COLORADO SPECIFICATIONS ALL CONTRACTS FOR THE CONSTRUCTION CIVE AUTOPEACHER OF THE DOCUMENTS BOUND HERENITH: Advertisement Instructions for Bidders Bid Forms General Conditions Governing All Cont Specifications D 00102 Roland L. Linder - Consulting Architect - Dec. Roberts and Schaefer Company - Lorisor and Associated Engineers and Architects - Chicago line Chrysola NO. / MANACES TO STATE OF STATE Tie Campbell ET NO. 26 July 1949

	BASE BID FOR CONTRACT NO. 2 - HEATING, VENTILA AIR CONDITIONING	TING &
	the sum of	
	Dollars (\$).
	DEDUCTIBLE ALTERNATE NO. 1 - CONTRACT NO. 2	
	If items defined under Section No. 8 - DED NO. 1 are omitted there shall be deducted from	JCTIBLE ALTERNATE the Base Bid
	the sum of	
	Dollars (\$	١.
	♣ ~	·•
	DEDUCTIBLE ALTERNATE NO. 2 - CONTRACT NO. 2	•
• .	If items defined under Section No. 8 - DE NO. 2 are omitted there shall be deducted from	
	the sum of	
•		
	Dollars (\$).
	Rourly Rate for operation of temporary he	ating as defined
	under Section 8, Article 3, the sum of	

the sum of		CTION
	Dollars (\$).
DEDUCTIBLE ALTERNATE NO. 1 - CON	TRACT NO. 3	
NO. 1 are omitted there shall be	on No. 9 - DEDUCTIE deducted from the	LE ALTERNATE Base Bid
•).
	<u>.</u>	
DEDUCTIBLE ALTERNATE NO. 2 - CON	TRACT NO. 3	•
If items defined under Secti NO. 2 are omitted there shall be	on No. 9 - DEDUCTIB deducted from the	LE ALTERNATE Base Bid
the sum of		
	DEDUCTIBLE ALTERNATE NO. 1 CON If items defined under Secti NO. 1 are omitted there shall be the sum of DEDUCTIBLE ALTERNATE NO. 2 - CON If items defined under Secti NO. 2 are omitted there shall be	Deductible Alternate No. 1 - Contract No. 3 If items defined under Section No. 9 - DEDUCTIB NO. 1 are omitted there shall be deducted from the the sum of Dollars (\$ Deductible Alternate No. 2 - Contract No. 3 If items defined under Section No. 9 - DEDUCTIB NO. 2 are omitted there shall be deducted from the the sum of

13

BAS	BE BID FOR COMBINATION OF CONTRACT NO. 3 - PLUMBING	ONING and	
the	sum of		
			····
		Dollars (\$	·).
DE D	OUCTIBLE ALTERNATE NO. 1 - CONTE	ACT NO. 2	
N. Tarak	If items defined under Section 1 are omitted there shall be defined there are the state of the s	leducted from the Base	
the	Bun of the water was the same and the same a	Dollars (\$	
DE D	OUCTIBLE ALTERNATE NO. 2 - CONTR	ACT NO. 2	
NO.	If items defined under Section 2 are omitted there shall be		
the	sum of		
		Dollars (\$).
und	Hourly Rate for operation of the Contract No. 2, Section 8, 1 Dollars (\$).	emporary heating as derticle 3, the sum of	sfined
DE D	OUCTIBLE ALTERNATE NO. 1 - CONTR	ACT NO. 3	
NO.	If items defined under Section 1 are omitted there shall be defined.		
the	sum of		·
		Dollars (\$).
DE DI	UCTIBLE ALTERNATE NO. 2 - CONTR	ACT NO. 3	* ·
No.	If items defined under Section 2 are omitted there shall be defined the shall be defined to the shall be defined t		
the	sum of		-
		Dollars (\$	Y

	BASE BID FOR CONTRACT NO. 4 - ELECTRIC	CAL POWER AND LIGHT	ring
·	the sum of	d dan min'n modige ambad di in diinka dalkin di inkanan in didikanan ayaa ayaa ayaa ay	•
	Doi).
	DEDUCTIBLE ALTERNATE NO. 1 - CONTRACT	NO. 4	
Was main A	If items defined under Section No. No. 1 are omitted there shall be deduced.	cted from the Base	Bid
	the sum of		
	Do:	llars (\$).
	DEDUCTIBLE ALTERNATE NO. 2 - CONTRACT	NO. 4	
	If items defined under Section No. No. 2 are omitted there shall be deduced.		
·	the sum of		
	Do	llars (\$).
	DEDUCTIBLE ALTERNATE NO. 3 - CONTRACT	NO. 4	
	If items defined under Section No. No. 3 are omitted there shall be deduced.		
	the sum of		
مين .	Do 3	•).

DE DU	JCTIBLE ALTERNA	TE NO. 4 - C	ONTRAST NO. 4		
NO.	If items defin 4 are omitted				
the	sum of				
			Dollars (\$	>.
	UNIT PRICE as	defined in S	ection No. 10,	Article 5	k, the
	of	ENERGICATION IN COMPANY STATES	Little Company		
1	UNIT PRICE as	The second second		0.00	
	ating and nover		•	_	

	BASE BID FOR CONTRACT NO. 5 - ICE RINK COMPLETE, INCLUDIN REFRIGERATION AND RINK FLOOR CONSTRUCTION	G
	the sum of	
	Dollars (\$	·).
	BASE BID FOR CONTRACT NO. 6 - WELLS AND PUMPING EQUIPMENT	one Suprembles of
icandriani i Santa Karanta	the sum of	
	Dollars (#).
	DEDUCTIBLE ALTERNATE NO. 1 - CONTRACT NO. 6	
	If the items defined under Section No. 3 are omitted shall be deducted from the Base Bid the sum of	there
	Dollars (\$).
	DEDUCTIBLE ALTERNATE NO. 2 - CONTRACT NO. 6	
	If the items defined under Section No. 3 are omitted there shall be deducted from the Base Bid the sum of	
17	Dollars (\$) .

GENERAL CONDITIONS GOVERNING ALL CONTRACTS

1. STANDARD FORM "GENERAL CONDITIONS"

"The General Conditions of the Contract for the Construction of Buildings," Fifth Edition, Art. I - 44, inclusive, as promulgated by the A.I.A., are hereby made part of all Contracts as if herein written out in full. Amendments to this Standard Form which follow shall be considered as supplementing or adding thereto. All standard provisions and parts thereof shall remain in effect so far as the wapply, unless specifically voided or amended.

2. AMENDMENTS TO STANDARD FORM "GENERAL CONDITIONS"

A. Definitions

- (1) The Contract Documents consist of the Agreement; General Conditions Governing All Contracts, the Advertisement, the Instructions to Bidders; Accepted Bid; Drawings, Specifications including Accepted Alternates and all Addenda issued prior to the execution of the Agreement, all as identified by the dated signatures of the parties to the Contract. These taken together form the Contract.
- (2) The Owner mentioned in the Contract Documents is the City and County of Denver. The Architect mentioned in Standard A.I.A. "General Conditions", and the Architect-Engineer mentioned elsewhere in the Contract Documents shall mean: Roland E. Linder--Consulting Architect, Roberts and Schaefer Company-Lorimer and Rose, Associated Architects and Engineers.
- (3) The words "approved", "satisfactory", "equal to", "adequate", "proper", "reasonable", "as directed", etc., refer directly to the Architect-Engineer's written decision which shall be issued upon written request.
- B. Standard References in Specifications by abbreviations refer to standards of procedure, quality and testing of materials of the various technical society groups, reports, codes and specifications in their latest published form at the date of advertisement for bids, even though reference is made herein to an earlier standard. When no reference to standard is made, ASTM Standard Specifications apply. References are as follows:

AIA American Institute of Architects

ACI American Concrete Institute

AISC American Institute of Steel Construction

American Standards Association - Project A62 ASA

American Society for Testing Materials ASTM

Asphalt Tile Association ATA

AWSC American Welding Society Code

BEC Building Exit Code - 9th Edition, 1948 (National Fire Protection Association)

FS Federal Specifications Facing Tile Institute FTI

NBFU National Board of Fire Underwriters

Structural Clay Products Institute SCPI

TCA Tile Council of America

Cooperation and Acceleration of Work

- (1) All Contractors shall coordinate their work with ## all adjacent work and shall cooperate with a the chernocades
 to facilitate the general sprogress of the work will be ach trade
 shall afford all other trades every reasonable opportunity for the installation of their work and for the storage of their materials.
 - If, in the judgment of the Architect-Engineer it becomes necessary at any time during the erection of the Building, in order to accelerate the work of any Contractor or Contractors, each Contractor, when so directed by the Architect-Engineer shall cease work at any point and transfer his men to such other point or points as may be required, and shall execute such portions of his work as may be necessary to promote the progress of the work as a whole and to enable other Contractors to hasten, properly engage and carry on their work; or shall temporarily omit such portions of his work as may be necessary due to delay in deliveries of materials, equipment, etc., or for the advancement of the work of the other Contractors, and shall go back thereafter and execute the work so left out at such time as the Architect-Engineer directs. All expense involved in such transfer or going back shall be borne by the Contractor concerned.

Claims for Extra Cost

- (1) In Art. 15 *Changes in the Work*, and in Art. 16. Standard Form "General Conditions", "reasonable time" is defined as within 14 days.
- (2) Art. 16 is amended as follows: The value of such extra work or change shall be determined by cost-plus-apercentage to be determined prior to the signing of, the Contract. It is understood that cost shall include the cost of direct labor, materials, equipment, field overhead and any other items directly applicable to the specific work. Office overhead shall not be included as a cost item.

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(3) Except in the event of an emergency affecting life or property, no claims for extras will be considered valid unless they have been authorized in writing by the Architect-Engineer and countersigned by the Owner. All change orders shall be prepared by the Contractor and submitted to the Architect-Engineer in triplicate and shall be consecutively numbered.

(4) The Contractor's itemized estimate sheets for all charges or credits for additions to, or deductions from, the work shown on the Drawings or described in the Specifications shall at all times be open to the inspection of the Architect-Engineer.

E. Schedules

Progress schedules on material deliveries and construction shall be furnished semi-monthly on each Contract in form and extent directed by the Architect-Engineer.

F. Errors and Omissions

- (1) If any errors or omissions appear on the Drawings, Specifications, or other Contract Documents, the Contractor shall, within five days after receiving such Drawings, Specifications, or other Documents, notify the Architect-Engineer of such omissions or errors.
- (2) In the event of the Contractor's failing to submit such notice, he will be held responsible for the results of any such error or omission and the cost of rectifying the same.

G. Insurance

- (1) General: No Contractor shall commence work on this building until he has obtained all the insurance required under the Contract Documents and such insurance has been approved by the Owner, nor shall the Contractor allow any Subcontractor to commence work on his Subcontract until all similar insurance required of the Subcontractor has been so obtained and approved. All insurance shall be taken out with a company rated as AA or better by Best's Insurance Service. Satisfactory proof by certification in triplicate shall be furnished of carriage of all required insurance.
- (2) Compensation Insurance: Each Contractor shall procure and shall maintain during the life of his Contract, Workmen's Compensation Insurance for all of his employees to be engaged in work on the project under this Contract and,

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in case any such work is sublet, the Contractor shall require the Subcontractor similarly to provide Workmen's Compensation Insurance for all of the latter's employees to be engaged in such work unless such employees are covered by the protection afforded by the Contractor's Workmen's Compensation Insurance. In case any class of employees engaged in hazardous work on the project under this Contract is not protected under the Workmen's Compensation statute, the Contractor shall provide and shall cause each Subcontractor to provide adequate and suitable insurance for the protection of such of his employees not otherwise protected.

- Property Damage Insurance: Each Contractor shall procure and maintain during the life of his Contract. Contractor's Compremensive Public Liability and Property Damage Insurance which shall include coverage for Contractor's our operations. Contingent liability of any Subcontractors who have failed to furnish evidence of their own insurance coverage, Contractual Liability, and any other exposure usual to the Contractor's operations in an amount not less than \$50,000 for bodily injuries, including accidental death, to any one person, and, subject to the same limit for each person, in an amount not less than \$100,000, on account of one accident; and Contractor's Property Damage Insurance in an amount not less than \$25,000 for any one accident with an aggregate limit for the policy term of not less than \$100,000.
- (4) Contractor's Comprehensive Automobile Liability and Property Damage Insurance: Contractor shall procure and maintain during the life of this Contract, Contractor's Comprehensive Automobile Liability and Property Damage Insurance covering Owned, Hired, or Non-owned automobile and truck exposure. This insurance shall also include contingent coverage for any Subcontractors who have failed to furnish evidence of their own insurance coverage in an amount not less than \$25,000 for bodily injuries, including accidental death, to any one person, and, subject to the same limit for each person, in an amount not less than \$50,000, on account of one accident; and Property Damage in an amount not less than \$25,000.
- (5) Fire Insurance: Art. 29 of Standard Form A.I.A. is supplemented as follows: The Owner shall effect and maintain Fire and Extended Coverage Insurance on a Completed Value Form. Coverage shall include Hail, Explosion, Flood, Wind, Hurricane, Tornado and Falling Aircraft damages.

H. Laws, Ordinances and Regulations

All Contractors and Subcontractors employed upon the work will be required to conform to the Labor Law of the State

of Colorado and the various acts anendatory and supplementary thereto; and to all other laws, ordinances, and legal requirements applicable thereto.

I. Liens

Article 32, "Liens" of the "General Conditions" shall be and is hereby supplemented as follows: Upon the request of the Owner, the Contractor shall at his own expense, by bonding or otherwise, secure the prompt discharge of any lien or liens which may be filed against the property arising out of this Contract.

J. Manufacturer's Specifications

All menusecoured or wholes, metoricles, and equipment since be seen used, element and conditioned as directed by the manufacturer, unless, therein specified to the contrary.

K. Time of Completion

- (1) It is intended that the work shall start immediately after signing of each Contract, and that the work shall be completed within the time alloted in the Instructions, to Bidders.
- (2) No extensions of time will be permitted except for authorized changes or causes not under the control of the Contractor. In such instances, the Contractor shall apply to the Architect-Engineer in writing, stating the cause and time requested. The number of calendar days allowed will be as mutually agreed upon by the Architect-Engineer and the Contractor.

L. Protection against Fire and Storm

All Contractors whill take all reasonable precautions to guard against fire and storm. Equipment for such protection shall be provided in accordance with the City regulations.

M. Samples

22

Art. 3 of Standard Form "General Conditions" is amended to the effect that all samples called for in the various sections of these Specifications, as well as others as directed, shall be submitted in duplicate. Samples shall be furnished so as not to delay fabrication and to allow the Architect-Engineer reasonable time for their consideration. Valuable samples will be returned after suitable record is made for later reference.

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N. Permits

Art. Il of Standard Form "General Conditions" is amended to the effect that each Contractor shall obtain and pay all fees for all permits required for his portion of the Work, give all legal notices, and make good any damages required by authorities having jurisdiction over the work. All permits shall be delivered to the Architect-Engineer upon completion of the project.

O. Schedule of Values

Art. 24 of the Standard Form "General Conditions" is supplemented to the effect that the Schedule of Values and Quantities mentioned therein shell be provided in triplicate by each Contractor immediately after each Contract is less tach Schedulershall be a breakdown of trades and costs totaling the amount of each Contract.

P. Scaffolding

Each Contractor shall furnish all scaffolding, ladders, protection for the work and related items necessary for the completion of his work.

Q. Watchman

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The Contractor for Contract No. 1 shall provide Watchman service at all times other than normal work hours.

R. Temporary Facilities

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- (1) Field Offices for each Contractor may be provided at the site during period of construction, located so as not to interfere with operations. Readily accessible copies of Contract Documents on each Contract shall be kept therein.
- (2) Materials Sheds and Storage shall be provided at site by each Contractor located not to interfere with operations and arranged for adequate protection of such materials.
- (3) Toilets shall be provided and maintained in sanitary condition where directed for use of all personnel on all Contracts by the Contractor for Contract No. 3. Toilets shall be equipped with standard fixtures, provided with water supply, and connected to sewer if required and possible; if not, pits shall be disinfected and filled upon removal. As soon as conditions permit, the Contractor for Contract No. 3 shall provide toilets within Building.
- (4) Water supply and one hydrant shall be provided under Contract No. 3. All further connections required for the operations shall be provided by the Contractor requiring them.

Water service charges shall be paid for by the General Contractor and the costs shall be assessed to the several contractors in proportion to use and in accordance with a schedule approved by the Architect-Engineer.

- (5) Telephone arrangements shall be provided by the Contractor for Contract No. 1 at his own expense for the convenience of his representatives, the Clerk of the Works, and the Architect-Engineer.
- (6) Advertising privileges are reserved by the Owner. No signs of any kind may be displayed except as required by the Drawings or authorized by the Owner.
- (7) Power and Light for temporary use up to 50 strings shall be provided for under Contract No. 4 and under prices for additional surings required by the various (or precional strings) and the attractor concerned. Current for entire temporary service shall be paid for by the General Contractor and the costs shall be assessed to the several Contractors in proportion to use and in accordance with a schedule approved by the Architect-Engineer.
- S. Specification Subdivisions are arranged for the convenience of reference and are not intended as listings of work included in any one Subcontract under a Contract.
 - T. Cutting and Patching.

Art. 43 of the Standard Form "General Conditions" is amended to the effect that each Prime Contractor shall be responsible for the provision of sleeves, inserts and locations for required openings, etc to the General Construction Contractor in time to prevent major cutting and patching. Such cutting and patching shall be paid for by each Contractor concerned. No holes over one inch in diameter may be cut through any material in place without approval of the Architect-Engineer.

U. Liquidated Damages

Supplementary to Art. 18 of the Standard Form *General Conditions*, time of completion is of the essence of these Contracts. Delay of one or more Contracts resulting in delay of others and extending the completion of the entire project shall be compensated for by the deduction from final payments of Liquidated Damages, as follows:

Contract No. 1 \$200.00 per day
Contract No. 2 to 5, inclusive, \$60.00 each per day
Contract No. 6 \$40.00 per day

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V. Terms of Payment

- (1) The Owner shall make payments on account of the Contract, as follows: On or about the first day of each month eighty-five (85) per cent of the value, based on the Contract prices, of labor and materials incorporated in the work, as substantiated by the Schedule of Values and Quantities, and of materials suitably stored at the site thereof up to the first day of that month as estimated by the Architect-Engineer, less the aggregate of previous payments; and upon substantial completion of the entire work, a sum sufficient to increase the total payments to eighty-five (85) per cent of the Contract price.
- (2) Substantial Completion shall consist of the cathing project fully anclosed, crescling, projected and usedle as descenting, projected and usedle as descenting by the archivest-Ingineers
- (3) If, after the work has been substantially completed, full completion thereof is materially delayed through no fault of the Contractor, and the Architect-Engineer so certifies, the Owner shall upon certificate of the Architect-Engineer and without terminating the Contract, make payment of the balance due for that portion of the work fully completed and accepted. Such payment shall be made under the terms and conditions governing final payment, except that it shall not constitute a waiver of claims. Liquidated damages specified above shall apply to full completion date as established in each Contract.
- (4) Upon full completion of Contracts, payment of 98% of the amount of each Contract, less previous payments, shall be made. The balance of 2% will be retained by the Owner for a period of one year from the date of final certificate as security on each Contractor's guarantee against defects in materials and workmanship.

W. Guarantee-Warranty

- (1) Each Contractor shall guarantee the work in place of all his Subcontractors for a period of one year from date of final payment certificate, and he shall furnish a written certificate in triplicate to that effect with application for final payment.
- (2) Each Contractor shall likewise warrant all work in place performed by his own organization for a period of one year from same date, and he shall furnish a written certificate in triplicate to that effect with final payment application

(3) Where longer periods are specifically stated in the individual sections, then warrants and guarantees shall be based on such periods.

I. List of Drawings

CONTRACT #1 Architectural Drawings

- A 1 Title Sheet and Plot Plan
- A 2 Arena Floor Plan and Barrier Details
- ▲ 3 Main Floor Plan
- Upper Seating Plan
- A 5 Roof Plan
- A 6 North and South Klevations
- A 7 East and West Elevations and Exit Door Details
- A 8 Arena Floor Southwest and Northwest Corner and Ticket Window Details
- A C Arena Leore C Reigh Half Plan and Shorer Room Details
- (10) Crimpings Continued and Southerns Course Man and Tobbel Libralia
- All Main Floor Southwest Corner Plan and Mullion and Chianey Details
 Al2 Main Floor Northwest Corner Plan and Project Sign
- Al3 Longitudinal Section at East End
- Al4 Longitudinal Section at West End and Roll-Up Door Details
- Al5 Transverse Section
- Al6 Main Entrance Flan and Elevations
- Al7 Main Entrance Details
- Al8 End Wall Details
- Al9 Pipe Rail and Miscellaneous Details
- A20 Window and Side Exit Details
- A21 Flashing and Insulation Details
- A22 Door Schedule and Details

Structural Drawings

- S 1 Ground Contour and Profiles
- S 2 Coordinates East End
- S 3 Coordinates West End
- S 4 Foundation Plan (Arch Columns)
- S 5 Foundation Plan (Bleacher and End Wall Columns)
- S 6 Footing Details
- S 7 Footing Details
- S 8 Ground Floor Plan
- S 9 Ground Floor and Grade Beam Details
- S10 Ground Floor and Grade Beam Details
- 311 Concrete Details
- 812 Concrete Details
- S13 East End Framing (Lower Level) (Forming)
- S14 West End Framing (Forming)
- S15 East End Framing (Upper Level) (Forming)
- S16 Column Details
- S17 Column Details
- \$18 Column Details

S40 Centering

CONTRACT #1 Structural Dwgs. (continued)

East End Framing (Lower Level) (Reinforcing)
East End Framing (Lower Level Slabs) (Reinforcing) East End Framing (Upper Level) (Reinforcing) S21 S 22. West End Framing (Reinforcing) S23 Leanto Details S24 Leanto Details S25 Leanto Details romenade Level (Reinforcing) **3**26 Mezzanine Level Framing (Reinforcing) S27 Blencher Framing Plan - Best End \$28 Bleacher Framing Plan - West End S29 \$30° Bleacher Details Bleacher Details: \$31 Arch Reinforcing S32 S33 Arch Reinforging General Reinfercing Steel Details S37 Concrete Wall Details 533 Structural Steel End Mall Framing Catvalk Plan & Details 339

. CONTRACT #2 . Heating, Ventilating & Air Conditioning Dwgs.

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E-P-AC2
           Roof Plan
HV-AC-W-3
           Arena Floor plan
HV-AC-A
           Main Floor Plan
           High Level Plan-
HV-AC-5
HV-AC-6
           Boiler Room Details 3000
           Basement Pressing & Team Room Details
H7-AC-7
P-HV-AC-8
           West Mezzanine Detaile
          Mast Mezzanine Pettils
P-HV-AC-9
HV-AC-10
           General H.V.-1.C. Details
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Plumbing & Fire Protection Dwgs.

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E-P-1 Plot Plan
E-P-AC-2 Roof Plan
P-3 Arene Floor Plan
P-4 Main Floor Plan
P-5 Public Toilet Details
P-6 Basement Dressing & Team Room Details
P-7 Plumbing Riser Diagrams
P-HV-AC-8 Vest Mezzanine Details
P-HV-AC-9 East Mezzanine Details
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CONTRACT #4 Electric Power & Lighting

E-P-1	Plot Plan
E-P-AC-2	Roof Plan
E-3	Arena Floor Plan - Electric Light & Power
$E - l_{\scriptscriptstyle +}$	Main Floor Plan - Electric Light & Power
E-5	High Level Plan
E-6	Arena Floor Plans - Communications
E-7	Main Floor Plans - Communications
E-8	High Level Plans - Communications
E - 9	Riser Diagrams - Light & Fower
E-10	Riser Diagrams - Communications
E-11	Detail Sheet
E-12	Mechanical Equipment & Electrical Switchgear Rooms
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CONTRACT #5

R-I Ice Rink Layout & Plant Room R-2 Ice Rink Details

CONTRACT #6

MV-AC-W3 Arena Floor Plan

CONTRACT NO. 1 - GENERAL CONSTRUCTION SECTION NO. 1 -- SPECIFIC REQUIREMENTS.

1. APPLICABILITY OF CONTRACT DOCUMENTS

The Contract Documents shall be those defined as such in the Agreement. The "General Conditions Governing All Contracts" shall apply to all work of this Contract.

2. SCOPE

The work under this Contract shall consist of furnishing all labor, materials and equipment necessary and required to complete all general construction for the Denver Municipal Stadium, as shown on the Drawings, as described in the Specifications, or as reasonably inferable from the Drawings and Specifications for Contract No. 1.

WORK NOT IN THIS CONTRACT

All work of the mechanical and electrical trades as defined in Contracts 2 to 6 inclusive is not a part of this Contract.

4. PROGRESS PHOTOGRAPHS

Starting when the work begins, the General Contractor shall take monthly photographs in sufficient number to show the progress of the work. Prints shall be 8 in. x 10 in. in size, glossy finish. One print of each photograph shall be sent to the Architect-Engineer and two to the Owner. All negatives shall bear the date of exposure and the name of the work and shall be delivered to the Architect-Engineer on completion of the job.

TEMPORARY SERVICES AND FACILITIES

The Contractor shall carefully note the requirements listed under the "General Conditions Governing All Contracts".

Temporary Facilities В.

(1) Field Office for use of Contractor for Contract

No. 1, Subcontractors, Architect-Engineer and Clerk-of-the-Works shall be provided and maintained by the Contractor. Building shall consist of at least two rooms, one of a bout 80 sq. ft. for the use of the Architect-Engineer and the Clerk-of-the-Works. Building shall be provided with operating windows, doors with cylinder locks, heat and light, tables, counter, chairs and racks for Drawings. When a suitable room in the project building becomes available, the field office may be located therein. At his own expense the Contractor shall cause an office type telephone extension from job telephone to be provided for the use of the Architect-Engineer and the Clerk-of-the-Works.

(2) Upon completion, or as directed, all such facilities including storage sheds shall be removed.

6. PROTECTION

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The Contractor shall provide and maintain all necessary or required barricades, railings, guard lights and similar items for the protection of the public and property. He shall provide all necessary shoring and bracing to properly support all parts of the work during construction.

7. MEASUREMENTS, GRADES, LINES AND LEVELS necessary to the location and erection of the building and the establishing of rough grades shall be determined by a licensed surveyor employed by the Contractor for Contract No. 1. The Owner will establish the lot lines, restrictions and a bench mark. other grades, lines, levels and bench marks shall be established from Owner's bench marks b the Contractor for Contract No. 1 who shall maintain and be responsible for same. The Contractor shall verify all grades, lines, levels and dimensions as shown on the Drawings, and he shall report any errors or inconsistencies thereof to the Architect-Engineer before commencing The Contractor shall provide and maintain well-built batter-boards at all corners; establish bench marks in not less than two widely separated locations; and as the work progresses bench marks at each floor level; and on floors the exact location of all partitions to guide all trades and other Contractors concerned, A first-class leveling instrument shall be kept on the work, and the Architect-Engineer shall have unrestricted use of same at any time.

SECTION NO. 2 - EXCAVATION, FILLING, BACKPILLING AND GRADING

The "General Conditions Governing All Contracts" and the "Specific Requirements for Contract No. 1" shall apply to all work of this Section.

1. SCOPE

The work under this Section shall consist of furnishing all plant, labor, equipment, appliances and materials, and in performing all operations in connection with excavation, filling, backfilling and grading as shown on the Drawings, as herein specified, or as reasonably inferable from the Brawings and Specifications generally as follows:

- A. All general excavation and stockpiling.
- B. Excavation for footings and walls.
- C. Pit and trench excavation
- D. Filling
- E. Backfilling
- F. Cleamup

2. MATERIALS

A. Material Available at Site

The coarse grained sand occurring approximately between elevations zero (0) and minus five (-5) excavated at the site may be stockpiled and used for filling and backfilling.

B. Borrow

Any borrow material used for filling shall be a well graded mixture of natural sand or sand and gravel, free from topsoil, organic material and excessive amounts of clay and silt.

5. WORK MANSHIP

A. General

The location of the building and the elevation of the floor, footings, foundations, utilities and existing and finished grades are indicated on the drawings. The grades shown on the drawings will establish the volume of excavation, filling and backfilling to be performed.

B. Clearing Site

The site shall be cleared of all natural obstructions and any organic matter or topsoil which shall be stockpiled for future use or be wasted as directed by the Architect-Engineer.

C. Excavation

The Contractor shall do all excavation of every description and in whatever medium encountered to the dimensions and levels shown on the drawings for all foundations, footings, piers, valls, floor areas, pavements, etc. Boring samples of the materials to be encountered are available for inspection. Excavations shall be sufficiently large to allow for inspection. Excavation required under other Contracts are not the responsibility of this Contractor unless specifically noted otherwise

- (1) At the west end of the structure it will be necessary to remove all of the existing sand-and manure fill for its full depth of as much as twenty-six (26) feet below datum as shown on the drawings. This material shall be disposed of where directed by the Architect-Engineer.
- (2) The coarse sand excavated between elevation zero (0) and elevation minus five (-5) shall be stockpiled for future use as a fill or backfill material. The material occurring generally above elevation zero (0), which is of a silty nature, shall be stockpiled for future use in the general grading of the site or wasted as the Architect-Engineer may direct, but shall not be used as a fill or backfill material within the building area.
- (3) If, in the opinion of the Architect-Engineer, the soil at elevations shown on the drawings for the bottom of the footings will not sustain the safe design load, the excavation shall be carried to such greater depth as ordered by the Architect-Engineer. Payment for excavation in excess of the amount indicated by the Drawings shall be based on the volume of earth removed directly below the footing assuming the sides of the excavation to be vertical, and the unit cost for excavation which the Contractor will submit together with his Bid.
- (4) Care shall be taken that excavations do not extend below the exact elevations of bottoms of footings. Should any excavation, without the approval of the Architect-Engineer, be carried below such elevation, the Contractor shall fill in the resulting space with concrete at no additional cost to the Owner. This concrete shall be poured up to the elevation of the bottom of the footing and shall serve as a base for the footing to rest upon.

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- (5) During cold weather, excavation for any portion of the building shall not be carried down to the depths indicated on the drawings unless the concrete footing can be immediately installed after the excavation has been completed. During general excavation enough earth shall be left above the bottom of the footings to protect against the danger of frost penetration to that depth. If, for any reason, the excavation has been carried down to the full depth and the concrete cannot be deposited immediately, the Contractor shall cover the bottom of the excavation with hay or other suitable material to prevent frost from affecting the exposed earth surface. The material required for this protection shall be furnished by the Contractor and removed by him immediately before the concrete for the foundation is placed.
- (6) The Contractor shall do all shoring and bracing necessary to support earth banks or adjoining parts of the structure and to prevent caving in and displacement of adjacent soil, furnishing all necessary timbers, oribbing, planking or sheet piling for such purposes. All bracing will be subject to the approval of the Architect-Engineer and shall be removed when so directed.
- (7) The Contractor shall support, shore up and protect all piping or conduits encountered and he shall immediately notify all parties responsible for same, and allow them to take any additional measures necessary.
- (8) Excavated material of suitable nature shall be used for backfilling or filling, except where otherwise specified. Any excess of excavated material and any material unsuitable for filling and backfilling shall be disposed of as directed by the Architect-Engineer.
- (9) Disposal of material unsuitable for fill or backfill shall be in the area adjacent to the west boundary of the building site as noted on the drawings.

D. Fill

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Fill shall be excavated materials free from roots or other organic material, trash, frozen materials or rock or stone having a maximum dimension in excess of four (4) inches. The fill shall be placed in layers not over eight (8) inches loose thickness and compacted to minety-two per cent (92%) compaction as determined by the Standard Proctor Compaction Test. Compaction shall be accomplished by means of a heavy tractor, preferably the equivalent of a Caterpillar D-7; or D-8. The fill should be built up and compacted to a height not less than three (3) feet above the final grade and the excess material removed thereafter. No footing shall be placed in fill portion until ground shall first have been compacted to a height of at least 3-ft. above bottom of footing.

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- (1) All of the manure contaminated fill at the west end of the structure shall be removed and replaced with compacted fill.
- (2) The cost for performing the Standard Proctor Compaction
 Test shall be borne by the Contractor.
- (3) In the east portion of the building in which cutting will be necessary, the finished surface upon which the east end footings and bleacher footings will rest will require no further compaction.
- (4) All cutting and fill shall be carried to a distance of five (5) feet beyond the limits of the building except at the west end where the manure contaminated fill shall be removed and replaced by compacted fill to the lines.

 Indicated or the Drawings 2.

E. Backfilling

After completion of foundations, footings and walls and other construction including all utilities below the elevation of the final grades, all forms shall be removed and the excavation cleaned of trash and debris prior to backfilling.

- (1) Material removed during excavation or material secured from borrow areas approved by the Architect-Engineer shall be used for backfilling. It shall be free from trest, lumber, frozen material or other debris.
- (2) Backfill should be placed in horizontal layers not in excess of eight (8) inches loose thickness and each layer compacted by hand, machine, tampers or other suitable equipment to a density not less than ninety-two per cent (92) compaction as determined by the Standard Proctor Compaction Test.

*F. Grading

The subgrade shall be struck-off with approved planners, subgraders, or other equipment, and the surface shall be thoroughly compacted. When required, sufficient water shall be applied to properly consolidate the surface of the subgrade. After grading the surface of the subgrade shall not show any deviation in excess of one-tenth (1/10) foot when tested with a ten (10) foot straightedge. The elevation of the finished subgrade surface shall conform to the elevations shown on the Drawings.

- (1) All grading shall be carried to a distance of five (5) feet beyond the limits of the building, however it shall be the Contractor's responsibility to maintain adjacent areas against slides and insure adequate and safe drainage of the general building site.
- (2) If necessary, all newly-graded areas shall be protected from the action of the elements.
- (3) Any settlements of graded areas shall be repaired as directed by the Architect-Engineer.

G. Clean Up

The entire area in the vicinity of the building where excavation, filling, backfilling and grading is to be performed shall be cleared of all trash, wood forms and other debris, after completion of the work specified; and raked clean; and all spoil piles shall be leveled and excess material disposed of on site as directed by the Architect-Engineer.

H. Payment

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The footing elevations shown are established in accordance with the best available soil information and may be subject to slight change according to actual conditions found. The Contractor shall present unit prices for excavation and backfilling in connection with such footing changes as may be determined by the Architect-Engineer. The Drawings show the extent of removal of unsuitable material and filling with good material. Any excavation in excess of the amount shown, or of greater cost than anticipated due to soil conditions presently unknown will be compensated for on a basis of cost plus ten per cent (10%) or on a negotiated lump sum basis. Similarly any quantities of excavation less than that indicated on the Drawings shall constitute a basis for a refund by the Contractor.

- (1) Excavation shall not be carried beyond the depths indicated on the Drawings without first obtaining the approval of the Architect-Engineer.
- (2) The order of excavation shall depend upon which one of the plans, "A", "B", "C" or "D", has been selected to be followed by the Contractor as outlined in Section 3, Paragraph 3.

SECTION NO. 3 - CONCRETE

The "General Conditions Governing All Contracts" and the "Specific Requirements" for Contract No. 1 shall apply to all work of this Section.

1. SCOPE

The Contractor for Contract No. 1 shall furnish all labor, materials and equipment required to complete all plain and reinforced concrete work and cement finishes as shown on the Drawings, as described in the Specifications or as reasonably inferable from the Drawings and Specifications, generally as follows:

- (1) Plain and reinforced concrete work, except the ice
 - (2) Concrete and cement finishes.
 - (3) Reinforcing steel and accessories such as spacers, chairs, ties, etc.
 - (4) Formwork.
 - (5) Expansion Joints.
 - (6) Curing materials.
 - (7) Lightweight concrete fill (also referred to as "Vermiculite").
 - (8) All items, shown on the Drawings or described in other sections of the Specifications for Contract No. 1 as well as all other Contracts, which must be incorporated in the concrete and maintained in position, i.e., inserts, hangers, anchors, sleeves, nailing blocks, bolts, reglets, etc.

2. DESCRIPTION

A. General

The reinforced concrete structure for the stadium is to be approximately 339 feet long by 308 feet wide. An additional curved entrance structure is located at the east end, increasing the over-all length of the structure to about 400 feet. The principal structural elements are as follows:

- (1) The curved concrete roof structure
- (2) The lean-to structures along the north and south sides

- (3) The architectural concrete walls at the west end and north and south sides
- concrete
 (4) The lobby and/marquee structure at the east end
- (5) The bleacher system
- (6) Floors

B. Curved Roof Structure

- (1) The curved roof structure is of the reinforced concrete shell type, commonly referred to as the "Z-D System". It has a clear span of about 254 feet and consists primarily of the arches, 28 feet on center, and the curved roof shell slab.
- (2) Each arch is supported on the concrete lean-to columns and foundations as shown on the Drawings. The thin shell concrete slab portion of the roof receives its rigidit from its curvature, from the arches and from the lean-to structure along the shell's north and south boundaries. The roof shell slab is to be considered as a girder of curved cross-section of great width and rigidity. The roof shell slab and its supporting arches are to be considered as a unit and must be constructed monolithically.
- (3) This roof system is divided longitudinally into three units by two expansion joints about 112 feet on center. Each roof unit is divided by a construction joint into two roof pours. Each roof pour consists of three arches and the connecting curved roof slab which are to be poured monolithically.
- (4) The concrete work in this roof system must be of high quality, calling for care and accuracy in placing and finishing. The services of an experienced engineer of the Architect-Engineer firm will be available to the Contractor for construction advice. This individual engineer, fully acquainted with the type of construction, will assist the Contractor in the planning of the work, the proper handling and placing of forms, and centering, setting of reinforcing bars and the placing and finishing of the proper quality of concrete. Inasmuch as the early completion of the structure is of great importance to the Owner, the Contractor is expected to cooperate with the Architect-Engineer in arriving at a procedure of construction which will enable him to finish the work within the shortest possible time.

C. Lean-to Structures

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(1) The lean-to structures, which are to be situated along the north and south sides of the building, consist mainly of the lean-to footings, the lean-to columns and pedestals, the lean-to roof slabs and, where they occur, the intermediate lean-to floor slabs and the mezzanine floors.

- (2) Each lean-to structure is divided longitudinally into three units by expansion joints about 112 feet on center which extend through the roof system and through the lean-to columns to the top of the footing or pedestal as shown on the Drawings.
- (3) The lean-to structures also serve as supports for portions of the bleachers.

D. Architectural Concrete Construction

The architectural concrete construction consists mainly of the following items, as well as any others shown on the Drawings:

- (1) West wall: Only the lower portion of the west wall is of architectural concrete construction. Most of the west wall consists of structural steel framing which is hungiron the curved concrete troof and less character from the concrete wall by a definite joint.
- (2) Exposed faces of the lobby and marquee structure at the east end.
- (3) The walls along the north and south sides.

 The serrated walls shown on the Drawings may be assembled from precast units, they may be built of tilt-up construction, or they may be poured in place.
- (4) East and west ends of the lean-to structures.
- (5) Exterior basement walls.

E. Bleachers

- · (1) In the east end of the stadium the lower bleachers are to be supported on the ground or on compacted fill. The bleachers in the west end and the upper bleachers in the east end are to be supported by concrete structural framing.
 - (2) The bleacher seating units, supported cast-in-place beams and columns, may be constructed as follows:
 - (a) Assembled from precast units.
 - (b) Poured in place

3. CONSTRUCTION PROCEDURES

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Procedures mentioned in the following paragraphs are intended only as suggestions for the Contractor. The Contractor is free to follow any feasible plan that he may conceive as may be approved by the Architect-Engineer.

A. Seneral Construction Plans

- (1) Under Plan "A" and Plan "B" the Contractor will make use of the original ground surface which, suitably terraced, will support a roof sentering of substantially reduced height. In these Plans, Contractor will build the curved roof structure, and will do final grading and excavation after completion of the roof pours.
- (2) Under Plan "A" construction of the roof will start at the east end and will proceed towards the west. Work on other parts of the stadium will follow behind the centering in a westerly direction.
- (5) Under Plan "B" construction of the roof will start at the west end and will proceed in an easterly direction.

 After the centering is moved forward, the Contractor may begins removal of sunsuitable soil at the west end Cockfill with good soil, and grade to final elevations. The concrete work of the bleachers and the west end wall may closely follow the construction of the roof.
- (4) Under Plan "C" and Plan "D" it is proposed that most of the earthwork and grading be completed before beginning work on the curved roef structure. In these two plans the centering will not be supported on the terraced original ground, but will be supported on earth that is at or near the final grades. This will increase the height and cost of the centering. However, in view of the late season and the possibility of better prices for excavation and grading obtainable under Plans "C" and "D", the Contractor may choose these plans which will permit him to do general work during thewinter which, under Plans "A" and "B", he would not be able to do before the spring of the coming year.
- (5) Under Plan "C" construction of the roof will start at the east end of the stadium. At column line "6" the Contractor will have to make adjustments in the height of the centering towers due to the change in grades between exeavated and unexcavated ground floor areas.
- (6) Under Plan "D" the work will be essentially the same as Plan "G", except that roof construction will start at the west end and proceed in an easterly direction.

B. Curved Roof Structure

In general, it is suggested that the construction should proceed in the following order:

- (1) Excavate for lean-to footings
- (2) Begin construction of lean-to footings

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- (3) After the footings for the first lean-to unit are completed, begin work on the lean-to structures.
- (4) The curved roof depends upon the lean-to structures for its support and restraint. Therefore, all of the principal structural elements of the lean-to units must be in place and have adequate strength before concrete placing operations are begun on the curved roof, except the mezzanine floors and the bleacher girders at elevation 26-ft. 6-in.
- (5) After the first pours are made on the lean-to columns or pedestals, backfill around them and prepare the ground surface to support the centering.
- (6) Lay the foundation for the centering.
- (7) Breat the centering for the curved roof and prepare for the roof, pour tell is considered advisable that the celling insulation for the curved roof be placed on the forms prior to the placing of concrete.
 - (8) It is contemplated that a movable arch centering and form-work for the arched roof, about 60 feet in length, will be constructed approximately simultaneously with the construction of the lean-to structure. The ceiling of the curved roof structure is smooth and free of obstructions so that the centering with comparative case can be moved from the location of one roof pour to the next. The six roof pours will be the major steps in the completion of the entire structure, setting the pace for the completion of the Contract.
 - (9) Execute the first roof pour.
 - (10) After the concrete in the first roof pour has developed sufficient strength, decenter and move the centering forward for the next roof pour. The Architect-Engineer representative will have general direction of the decentering operation. The centering may be moved forward by the use of winches, pinch bars, tractors, or other means approved by the Architect-Engineer.
- (11) The general construction progress of the Contract will depend to a great extent on the decentering time after each roof pour. The time for decentering of the curved roof structure shall depend entirely upon the strength and elastic properties of the concrete. It is estimated that within five days, under favorable weather and curing conditions, the concrete in the roof will have developed sufficient strength and elastic properties to permit decentering, as approved the Architect-Engineer representative. In order to obtain adequate strength in the concrete in less time, so that early removal and reuse of forms will permit maximum construction speed, it may be advisable for the Contractor to consider the use of high-early-strength coment.

- (12) In order to expedite the progress of construction, the work should be continued in the following order:
 - (a) Earthwork and the construction of the remaining lean-to structures should proceed ahead of the centering as fast as conditions permit.
 - (b) The erection of walls, stairs and bleachers, the construction of the grade beams and floors, the installation of utilities and other work on the stadium should follow as closely as practical behind the centering as it is moved forward.

4. GENERAL CONSIDERATIONS

A. Cooperation with other Trades

Ample opportunity and suff ecoperations shall be given the various trades to install their required embedded items. Suitable templates or instructions, or both, shall be provided by the respective trades for setting such items as are not placed in the forms by them.

B. Bidding

Contractors shall present a lump sum bid on the structure as shown on the Drawings with footings located at elevations shown. Footing elevations are established according to best soil information available and may be subject to slight change according to actual soil conditions found. The Contractor shall submit unit prices for concrete, reinforcing steel and formwork which will be used to adjust his lump sum price downward or upward depending upon actual field conditions.

5. MATERIALS

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A. Portland Coment

Only one brand of cement shall be used for the exposed concrete in the structure. Cement reclaimed from cleaning bags or loaking containers shall not be used. Cement shall be used in the sequence of shipments received, unless otherwise directed by the Architect-Engineer.

- (1) Portland cement shall conform to the standard specifications and tests prescribed by A.S.T.M., G150-46-Type 1, latest edition.
- (2) High-early strength Portland Cement shall conform to the standard specifications and tests of the A.S.T.M., C150-46-Type III, latest edition.

- (3) Air-entraining coment shall conform to the requirements for Type LA coment prescribed by A.S.T.M., designation C175-47T.
- (4) Immediately upon receipt at the site of the work, cement shall be stored in a dry, weathertight, properly ventilated atructure with adequate provision for the prevention of absorption of moisture.

B. Fine Aggregate

- (1) Fine aggregate shall be washed sand having hard, strong, durable particles and shall be free from injurious amounts of seft or flaky particles, shale, loam, alkali, organic matter, ot other deleterious substances as determined by standard A.S.T.M. tests. It shall contain not more than indee por cone (57) by voicing of tilly or other particles capable of passage through a location of the containing through a location.
- (2) In the event suitable tests and a service record, that are satisfactory to the architect-Engineer, are not available, as in the case of newly operated sources, the fine aggregate shall be subjected to such tests as specified by the appropriate A.S.T.M. standards, as are necessary to determine its acceptability for use in concrete for the proposed structure. The tests to which the aggregate will be subjected will include specific gravity, absorption, soundness in magnesium sulfate, wetting and drying, heating and cooling and freezing and thaving in concrete and alkaliaggregate reaction.
- (3) The percentage of material finer than No. 200 sieve shall be determined in accordance with the Standard Method of Test for Amount of Material Finer than No. 200 Sieve in Aggregates (A.S.T.M. Designation: Cll7-37) of the American Society for Testing Materials.
- (4) Sand shall be tested in accordance with the Standard Method of Test for Organic Impurities in Sands for Concrete (A.S.T.M. Designation: C40-33) of the American Society for Testing Materials, and any sand showing a color darker than the reference standard color section, shall not be used.
- (5) Fine aggregate shall be graded from source to fine within the following limits:

Particle Size		20	PerCent by Weight		
Passing	No. 4	sieve	95 to 100		
я	8	#	80 to 90		
17	16	₩	55 to 7 5		
Ħ	30	Ħ	30 to 60		
n	50	×	12 tó 30		
11	100	pt .	3.5 to 10		

In addition to the grading limits shown above, the fine aggregate, as delivered to the mixer, shall have a fine-ness modulus of not less than 2.40 or more than 3.00 and, during normal operations, the grading of the fine aggregate shall be controlled so that the fineness moduli of at least nine of ten test samples of the fine aggregate as delivered to the mixer shall not vary more than 0.10 from the events finance modulus in fineness modulus and the determined by dividing by 100, the cum of the commission percentages retained on U.S. Standard Sieves Nos. 4, 8, 16, 50, 50 and 100.

- (6) The grading of fine aggregate shall be determined in accordance with the Standard Method of Test for Sieve Analysis of Fine and Coarse Aggregate (A.S.T.M. Designation: C136-46) of the American Society for Testing Materials.
- (7) Fine aggregate shall be of such quality that mortar composed of the fine aggregate and Portland cement shall have tensile and compressive strengths at the ages of seven days and twenty-eight days not less than those of mortar composed of standard Ottawa sand and the same cement. The tensile test for fine aggregate in mortar shall be made in accordance with the Standard Method of Test for Tensile Strength of Hydraulic-Cement Mortars (A.S.T.M. Designation: C190-44) of the American Society for Testing Materials. The compressive test for fine aggregate in mortar shall be made in accordance with the Standard Method of Test for Compressive Strength of Hydraulic-Cement Mortars (A.S.T.M. Designation: C109-47) of the American Society for Testing Materials).

(8) The testing of aggregates by a testing agency approved by the Architect-Engineer before permission for their use is granted, shall be the responsibility of the Contractor.

(9) Fine aggregate shall be stockpiled at least 48 hours before being used.

C. Coarse Aggregate

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(1) Coarse aggregate shall consist of clean, hard, strong, durable gravel or crushed stone. Crushed stone shall be granite, dolomite limestone or trap rock. Coarse aggregate shall be free from injurious amounts of soft friable, thin

elongated or laminated pieces, alkali, loam, clay, organic or other deleterious matter, and shall be free from an amount of material finer than No. 200 sieve in excess of one-half of one per cent. Aggregates containing sulphite and mine tailings shall not be used.

(2) In the event suitable tests and a service record, that are satisfactory to the Architect-Engineer are not available, as in the case of newly operated sources, the coarse aggregate shall be subjected to such tests, as specified by the appropriate A.S.T.M. standards, as are necessary to determine its acceptability for use in concrete for the proposed structure. The tests to which the aggregate will be subjected will include specific gravity, absorption, Los Angeles abrasion, soundness in magnesium sulfate.

Los Angeles abrasion, soundness in magnesium sulfate.

Letting and drying heading and cooking, and processor the transmit consects one cooking, and processor.

(3) Except as otherwise herein specified; coarse aggregate shall be of the nominal three-quarter inch size, graded from coarse to fine within the following limits:

P	article	Size		Per	Cent	by	Wei	ght
Deadas	7 1						300	
Passing		steve					100	
Ħ	3/4 "	×			90	to	100	
Ħ	3/8 *	Ħ			20	to	55	
Ħ	No. 4	Ħ	٠.		0	to	10	

(4) Coarse aggregate for Type *B" concrete shall be nominal 12" size, graded from coarse to fine within the following limits:

Partic	le Size	Per Cent	by.	Wei	ght
Passing 2-in		25		100	٠.
$\frac{1}{2}$	n n H fi		to :		•
м 3/8 и No.		10	to to	30 5	

- (5) The grading of coarse aggregate shall be determined in accordance with Standard Method of Test for Sieve Analysis of Fine and Coarse Aggregate (A.S.T.M. Designation: C156-46) of the American Society for Testing Materials.
- (6) The uniformity of the coarse aggregate from any one source shall be determined from the fineness modulus and shall be such that the fineness modulus of subsequent deliveries shall not vary by more than 0.10 from the fineness modulus.

of the first delivery from said source. The fineness modulus is obtained by adding the total percentages of the sample of the aggregate retained on each of the following specified series of sieves, and dividing the sum by 100: No. 100, No. 50, No. 30, No. 16, No. 8, No. 4, 3/8-inch, 3/4-inch and 1½-inch. The sieve analysis shall be made in accordance with Standard Method C 136-46 (ASTM).

Coarse aggregate combining two or more sizes of aggregate shall be produced either by proportioning and mixing on a conveyor belt or by weighing separately and mixing two or more sizes of aggregate at the batching plant, to produce the specified grading

D. Lightweight Concrete Aggregate

Aggregates for lightweight comprete shall be one of the following types:

- (1) Clay or shale burned to incipient fusion and expanded into a uniform cellular structure in which the cell walls are thoroughly witrified.
- (2) Natural, or suitably processed synthetic atoms that possesses characteristics which will produce results equivalent to the above materials.
- (3) Other materials, except cinders, free from combustible particles and ingredients injurious to concrete or steel, suitably processed to produce results equivalent to the above and as approved by the Architect-Engineer.

E. Aggregate for Ice Rink Finish

Aggregate for ice rink finish shall consist of one (1) part fine aggregate and two (2) parts course aggregate conforming to the following requirements:

- (1) The fine aggregate shall pass a one-quarter (1/4) inch sieve. Not more than five per cent (5%) shall pass a 100-mesh sieve and not more than ten per cent (10%) shall pass a 50-mesh sieve.
- (2) The course aggregate shall be graded from one-eighth (1/8) inch to three-eighths (3/8) inch with at least ninety-five per cent (95%) passing a three-eighths (3/8) inch mesh sieve and not ever ten per cent (10%) passing a number eight (8) sieve.

F. Admixtures

- (1) Air-entraining admixtures shall conform to the standard specifications and tests prescribed by Federal Specification 83-A-192.
- (2) If, when using an air-entraining Portland Cement, it is necessary to add an air-entraining admixture to adjust the air content, the same admixture shall be used as was integrated in the sement.
- (5) An accelerating agent shall be calcium shleride conforming to the requirements of Federal Specification O-C-106.
 Accelerating agent shall be used only upon approval by the Architect-Engineer.

(4) CEO-LEWISCO

Admixtures desired for any other purpose may be used only with the written approval of Architect-Engineer.

G. Water

Water for mixing and curing concrete and mortar shall be fresh, clean water from City mains supplying drinking water.

H. Reinforcement

- (1) Bar reinforcing steel shall be new billet steel, intermediate grade, conforming to the Standard Specifications of the A.S.T.M., Designation A-15, or rail steel, hard grade, conforming to the Standard Specifications of the A.S.T.M., Designation A-16.
- (2) Certified copies of mill reports shall accompany all deliver ies of reinforcing steel, except that if hard grade, rail steel, reinforcement bars are provided a certificate shall be furnished the Architect-Engineer stating that the bars have been manufactured in accordance with the requirements of the Rail Steel Bar Association.
- (3) All reinforcing bars shall be deformed except that three-eights (3/8) inch diameter and smaller bars may be furnished plain.
- (4) All dowels for expansion joints shall be furnished plain, without deformations.
- (5) All bars in the curved roof shell slab one-half (1/2) inch diameter and larger shall be of intermediate grade billet steal.
- (6) Wire mesh reinforcement shall conform to the Standard

 Specifications of the A.S.T.M., Serial Designation Al85, we have the form for related specific about for concrete reinforcement. They shall conform to the Standard Specifications of the A.S.T.M., Serial Designation A82, latest Edition, for cold drawn steel wire for concrete reinforcement.
- (?) Ties at intersections and laps shall be 18 ga. black annealed wire.
- (8) Spacer Bars and Chairs shall be standard commercial metal supports, cement briquettes, or concrete blocks. They shall be the product of a manufacturer approved by the Architect-Engineer. Bar chairs shall have galvanized legs.

Reinforcing accessories used in the curved roof slab shall be of such construction that they will not cut or puncture the cork insulation, or other material used for the ceiling of the roof shell.

I. Expansion Joint Material

(1) Preformed expansion joint material for concrete work shall be of preformed

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resilient, compressible, re-expanding, non-extruding bituminous and fibre material, conforming to Federal Specification HH-F-334, and similar to "Flexcell" as manufactured by The Celetex Corporation, or other approved equal.

(2) Joint compound, poured type, shall conform to Federal Specification SS-F-336, and shall be delivered to the building site in the manufacturer's sealed containers.

J. Membrane Curing Compound

Curing compound shall be non-toxic and shall contain a dye that will not permanently alter the natural color of the consrete, but which will impart sufficient color at time of application to indicate readily the areas covered. The curing compound shall be approved by the Architect-Engineer prior to its use.

K. Forms

- (1) Material for forms shall be unlined or lined wood, plywood, metal, or other material approved by the Architect-Engineer Forms for exposed surfaces of spandrels, lean-to columns, and ceilings and columns in the promenade area shall be plywood or smooth steel.
- (2) Wood forms for unexposed surfaces shall be No. 2, common, or better. Unlined wood forms for exposed surfaces shall be No. 1 common consued and proved boards of uniform they not oxiomaling 10 and providing or shall be likely not oxiomaling to the providing to the providing to the providing to the providing of the providing to the providing of the providing to the providing of the providing o
- (3) Plywood for forms shall conform to Joint Army-Navy
 . Specification JAN-P-66, commercial Douglas fir, moistureresistant, concrete form plywood, not less than 5-ply
 and at least 5/8-in. in thickness.
- (4) Plywood for form liners shall be as required in the preceding paragraph, except that the thickness and number of plies may be reduced subject to the approval of the Architect Engineer.
- (5) Fressed wood fiber board shall be of the tempered type, not less than 3/16-in. thick. It shall not be oiled or lacquered. A wax compound, approved by the Architect-Engineer may be applied for water proofing.

- (6) Form ties approved by the Architect-Engineer shall be used. They shall have a minimum working strength when fully assembled of 3000 lbs. Ties shall be so adjustable in length as to permit tightening of forms, and of such design as to leave no metal closer than 1-1/2-in. to the surface after removal. They shall not be fitted with any lugs, cones, washers, or other device to act as a spreader within the form or for any other purpose which will leave a hole larger than 7/8-in. in diameter or a depression back of the exposed surface of the concrete. Wire ties will not be permitted.
- (7) Form oil shall be a non-staining mineral oil.

L. Hardeners

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- (1) Hardening material shall be a colorless aqueous solution of zinc or magnesium fluosilicate; each gallon containing not less than 2 lbs. of crystals, such as "Lapidolith," or equal approved by the Architect-Engineer. It shall be shipped to site in manufacturer's original unbroken containers.
- M. Samples and Testing

It shall be the responsibility of the contractor to furnish samples and test reports where required by the Special cardons to the Architect-English in ade-i quate time for inspection and approval before incorporation into the structure.

6. FORME AND CHRISTING

A. General

- (1) Forms, complete with contering where necessary, shall be constructed to conform to the shape, form, line, and grade required, and shall be maintained sufficiently rigid to prevent deformation under load.
- (2) Joints shall be tight and leakproof and shall be arranged vertically or horizontally to conform to the pattern of the design. Where forms are placed in successive units for continuous surfaces, they shall be fitted to accurate alimement so that the completed surface will be smooth and free from irregularities.
- (3) In long spans, where intermediate supports are not possible, the anticipated deflection in the forms due to the weight of the fresh concrete shall be accurately figured and taken into account in the design of the forms, so that the finished concrete numbers will have true surfaces conforming accurately to the desired lines, planes, and elevations.
- (4) Adequate temporary openings shall be arranged in wall and column forms and where otherwise required, to facilitate cleaning and inspection.
- (5) Impler once used in forms shall have rails withdraws, and the current of the

B. Architectural Concrete Forms

- (1) Architectural concrete forms shall be used for the following surfaces.
 - (a) Exterior face of west wall

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- (b) All exposed concrete in east wall and concrete marquee structure
- (c) All walls of the Lean-to structure and basement
- (2) Architectural concrete forms shall be built with clean, sharp corners and with accurate attention to offsets, reveals and other architectural details. The face of the architectural concrete shall be smooth, dense and free of honey-combing.

- (3) The forms for architectural concrete shall be unde of plywood, metal, limed wood or other material, as approved by the Architect-Hagineer, which will produce a mooth surface.
- (4) Stude and wales small be not less them two (2) inches by four (4) inches, except that at least four (4) inches by four (4) inches shall be used at the vertical form joints. All stude and wales shall be No. I Western Fir or equal as expressly approved. All wales shall be doubled and the joints in the top and bottom pieces of each wale shall be staggered at least the spacing of the form ties. Vertical kick strips shall be used at the intersection of the vales at all external corners, and the corners shall be tightly wedged to prevent leakage.
- (5) Forms shall be substantial and shall be designed to remist the pressure to which they may be subjected, but under no conditions shall study be spaced more than sixteen (16) inches o.c. when used with three-fourths (3/4) inch plywood, or more than twelve (12) inch e.c. for thinner plyweed. Study used with plywood having the grain of the enter plies parallel to the study shall in all cases be spaced not less than twelve (12) inches e.c. Wales shall not be placed over twenty-four (24) inches e.c. Walls shall be spaced not more than twenty seven (27) inches e.c. on two (2) inches o.c. on two (32) inches o.c. on two (2) inches o.c. on two (32) inches
- (6) Where a lift of forms is ten (18) feet or more high, and at all spendrals regardless of the height, deviable too (2) kinch by six (6) inch vertical value shall be placed not more than ten (10) feet apart vertically, in no event less than two values to each panel, and belted to every other horizontal value to keep the forms straight and in true alignment.
- (7) Scoring, false joints or other examinatation shall be formed with moldings of white place or other soft wood cut to the proper shape, as shown on the Brawing, and fastened to the forms.
- (8) At construction joints special precautions shall be taken to prevent discularation of hardened constructs below the joint by leakage of the forms above.
- C. Centering for enred roof system.

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(1) The sentering and formsork for roof construction shall be built for one roof your approximately 254 feet by 58 feet in plan area.

The centering should be divided into a lewer structure of straight timbers and an upper structure of curved trusses. The Contractor shall consult with the representative of the Architect-Engineer regarding methods for design, construction and assembly of false-work.

- (2) The foundation for the centering shall be placed on level ground having sufficient bearing strength to support the load imposed upon it. The foundation should be of such a size that the centering will not settle more than the maximum allowable settlement specified in paragraph (5); below.
- (3) Steel rails and wheels may be provided for moving the centering to successive positions. The centering may be moved by the use of winches, tractors, or any other method approved by the Architect-Engineer.
- (4) Between the lower part and upper part of the centering screwjacks should be provided to make possible adjustment of forms as to straight lines and correct elevations. The screwjacks will also expedite the decentering operation, which must be performed smoothly and uniformly without jerks endangering the safety of the structure.
- (5) The centering, trusses and falsework must be able to support a load of 60 lbs. per sq. ft. in addition to the dead weight of concrete concentrated at the arches. All primary connections in timber framing shall be made with bolts or timber connectors. The centering and falsework shall be fully braced in all directions to prevent distortion under loads. The maximum deflection of the centering, when fully loaded with concrete placed on the forms, must not exceed 3/8-in. All centering trusses must be built in such a ranner that they will not change shape under one-sided loading by more than 3/8-in. from dimensions shown on the Drawings. The centering must be strong enough to carry the additional weight of the concrete arches within the permissible deformation stated.
- (6) The centering shall be adequately guyed with wire cables to prevent displacement or overturning by high winds.
- (7) The ceiling insulation or sound proofing material shall be laid on the curved roof forms before any reinforcing is placed. This material, if fastened to the forms, shall be fastened in such a manner that it will not be pulled away from the roof upon decentering. The ceiling material shall be securely fastened to the curved roof slab by the use of adequate anchors.

- (8) The decentering of the curved roof shell shall be done gradually and in the presence of and under the direction of the Architect-Engineer, after tests have shown that the concrete has developed the minimum strength and elastic properties as specified under "Decentering Tests", paragraph 12, C, of this section of these Specifications. Permission to decenter will not be given by the Architect-Engineer until these requirements are satisfied.
- (9) An accurate record of the horizontal and vertical movement of the lean-to footings and of the vertical deflection of the roof structure shall be maintained by the Contractor.
- (10) After the decentering operation, the centering and forms may be moved forward into the next pouring position.

In the new position, the trusses and forms shall be adjusted to their proper elevation, the ceiling material laid, the reinforcing and other embedded items placed and the arch forms erected.

C. Chamfered Comers

All corners of columns, girders, beams and other exposed corners, and joints in more than one plane shall be bevaled or chamfered by moldings placed in the firms, unless otherwise indicated on the Drawings, or directed by the Architect-Engineer. Except as otherwise indicated on the Drawings, the size of chamfers shall be as follows:

- (1) Girders, besses and columns other than arch columns = 3/47
- (2) Construction joints 1 1/8"
- (3) Arch ribs and arch columns $1 \frac{1}{2}$
- D. Coating contact Surfaces
 - (1) Forms for exposed surfaces shall be coated with oil, applied before the reinforcement is placed. After oiling, any surplus oil on the form surfaces and any oil on the reinforcing steel, shall be removed.
 - (2) Forms for unexposed surfaces may be thoroughly wetted with water in lieu of oiling, immediately before the placing of concrete, except that in cold weather with probable freezing temperatures oiling shall be mandatory.

E. Rubedded Items

(1) All material covered by the various divisions of this Specification that is to be emcased and built into the concrete work shall be properly placed in position in forms before concrete is poured.

Conduits placed within concrete members shall be embedded not less than 2 inches from any surface, except at outlets, unless otherwise approved by the Architect-Engineer.

(2) The Contractor shall carefully set in place and secure against displacement during pouring of concrete all inserts, templets, anchors, bults, sleeves, etc. as shown or required. (The Contractor is referred to other Sections of these Specifications and to other Contract Specifications.)

F. Removal of Forms

- (1) Forms shall not be disturbed until the concrete has adequately hardened. Shoring shall not be removed until the member supported has acquired sufficient strength to safely support its own weight and the load imposed on the shored member.
- (2) Care shall be taken to avoid spalling the concrete surface. The forms shall be free of embedded items, such as anchor bolts or templates, before resoved.
- (3) Fie-rod clamps that are to be entirely removed from the wall shall be loosened 24 hours after the concrete is placed and form ties, except for a sufficient number to hold the forms in place, may be removed at that time. These that are wholly withdrawn from the wall shall be pulled toward the inside face. The cutting of form ties beyond the face of the wall will not be permitted.
- (4) Architectural concrete forms shall remain in place for at least 4 days before removal.
- (5) The rod and bolt holes shall be filled in accordance with paragraph 22-E of this Section of these Specifications.

REINFORCEMENT

A. General

- (1) The reinforcing, fabricated to shapes and dimensions shown, shall be placed where indicated on drawings er reasonably required to carry out the intent of the drawings and specifications.
- (2) Reinforcement shall be accurately placed and securely tied at all intersections and splices with 18-gage black annealed wire, and shall be securely held in position during the placing of concrete by spacers, chairs or other approved supports. Wire tie ends shall point away from the form. Bar supports, spacers, chairs, etc. shall be provided in accordance with the "Manual of Standard Practice" for detailing reinforced concrete structures published by the American Concrete Institute except where otherwise shown upon the drawings.
- (3) Reinforcing, inserts, and embedded items shall be placed in such a manner that ceiling insulation will not be damaged.
- (4) Reinforcing rods shall be furnished with metal identification tags.
- (5) Before placing, all reinforcement shall be thoroughly cleaned of loose rust, mill scale or coatings, including ice, which would reduce or destroy the bond. Reinforcement appreciably reduced in section shall not be used. Following any substantial delay in the work, previously placed reinforcement, left for future bonding, shall be inspected and cleaned.
- (6) Reinforcement shall hot be bent or straightened in a manner that will impre the material. Bars with kinks or bends not shown on drawings shall not be placed. The heating of reinforcement for bending or straightening will not be permitted.
- (7) Reinforcement shall not be spliced at points of maximum stress. At all points where bars lap or splice, including distribution steel, a wire-tied minimum lap of 32 bar diameters shall be provided, unless otherwise shown. Splices in adjacent bars shall be staggered.

B. Design

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Reinforcing details shown on the drawings forming part of this specification, shall govern the furnishing, fabrication and placing of reinforcement insofar as they apply. Except as otherwise sown

or specified, construction shall conform to the following requirements:

(1) Except as otherwise shown on Drawings concrete coverage shall be provided over all reinforcing as follows:

1-1/2" to outside of main steel Beams & Girders Arches 1-1/2 to ties Slabs, shell & risers 3/4" to outside of steel 2" to outside main steel Tied columns 2" to outside of steel Walls: exposed against earth 3" to outside of steel 3" to outside of steel Footings: on sides on bottom 4" to outside of steel

- (2) Unless otherwise shown on the drawings, bars less than 3/8-inch dismeter shart not be used in the voir; except for stirrups, ties, and distribution steels
- (3) Bands and hooks, unless otherwise shown, shall be cold formed-around pins as follows:
 - (a) Bends for stirrups and ties shall be made around a pin having a diameter not less than two times the minimum thickness of the bar.
 - (b) A hook shall consist of a complete semi-circular turn with a radius of bend on the axis of the bar of not less than three, and not more than six times the bar diameter, plus an extension of at least four bar diameters at the free end of the bar.
 - (c) Bends for other bars shall be made aroung a pin having a diameter not less than six times the minimum thick-ness of the bars, except that for bars larger than 1" the pin shall be not less than eight times the minimum thickness of the bar.
- (4) Reinforcement shall be provided with anchorage at construction joints and wherever necessary to develop the strength of the section. Anchorage shall be provided by one of the following methods, unless otherwise shown:
 - (a) By extending the reinforcement beyong the face of the construction joint or support at least 32 bar diameters.
 - (>) By providing a standard hook.
 - (c) A proper combination of the foregoing.

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C. Shop Drawings

Shop detail and placing drawings for all reinforcing steel shall be furnished for approval of the Arch-Engineer.

8. EXPANSION JOINTS

A. General

Expansion joints shall be constructed at such points, and of such design as are indicated on the drawings. The expansion joint materials, as specified in other sections of the specifications, shall be installed as indicated on drawings and subject to the approval of the Arch-Engineer. In no case shall the reinforcement or other fixed metal items, embedded in or bonded into the concrete, be run continuous through an expansion joint.

B. Joints Between Slabs on Ground and Vertical Surfaces

Joints between slabs on ground and vertical surfaces where indicated shall be of premoided expansion joint-filler strips. Unless otherwise noted, or specified, such joints shall be the full depth of slab.

C. Joints with Compound

Where joints are indicated to receive joint compound, premolded expansion-joint filler strips shall be installed to the proper level below the finished floor, with a slightly tapered, dressed and oiled wood strip, tacked on top thereof, to provide a joint groove for the compound which is to be installed to a depth of not less than 1 inch after the floor has been finished and the oiled wood strip removed. Expansion joints indicated or specified to be made with joint compound shall have the joint groove left by removal of the wood strip filled with joint compund, poured type. Joint grooves shall be filled approximately flush so as to be slightly concave after drying.

D. Edges of Joints

The edges of concrete floors or concrete slabs along all expansion joints, across floor spaces, and around walls of finished spaces, shall be neatly finished along the edge of the premolded mastic, or the wood strips specified above, with a slightly rounded edging tool.

E. Joints Between Roof Units

These joints to be constructed as shown on drawings except that contractor will not be required to remove filler if compressible fibreboard is used and nails are driven into the one side of the fibreboard so that the nail heads will provide anchorage in the concrete.

9. CONSTRUCTION JOINTS

A. Location of Joints

Joints not shown or specified shall be so located as to least impair the strength and appearance of the work. Vertical joints in wall footings shall be reduced to a minimum. Except where indicated on the drawings, no jointing shall be made without approval from the Architect-Engineer. The placement of concrete shall be carried on at such a rate that the surfaces of concrete which have not been carried to joint levels, will not have attained initial set before additional concrete is placed thereon. Girders, beams and slabs shall be placed in one operation. Lifts shall terminate at such levels as are indicated on the drawings, or will conform to structural requirements or architectural details or both, as directed by the Architect Engineer.

Construction joints in architectural concrete walls where necessary shall be placed so as to coincide neatly with scoring or other ornamentation shown on the drawings.

Special provision shall be made for jointing successive pours as detailed on drawings or required by the Architect-Engineer.

B. Provision for Shear

Provision for shear shall be made by the use of inclined reinforcement at construction joints.

C. Arches and Curved Roof Slab

Concrete in the arches and curved roof slab shall be placed continuously in one operation to form a monolithic unit.

D. Limit of Placing Operation

Except as noted for the arches and curved roof slab the unit of operation shall not exceed 80 feet in any horizontal direction, unless otherwise required by the drawings. Concrete shall be placed continuously so that the unit will be monolithic in construction. At least 48 hours shall elapse between the casting of adjoining units, unless this requirement is waived by the Architect-Engineer.

E. Joints in Curved Roof Structure

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Any construction joints in the roof structure and its supports that connot be avoided must be arranged in consultation with the representative of the Architect-Engineer. Where such construction joints occur, additional dowels and keys shall be placed in the concrete, the surface of the old concrete shall be roughened, cleaned, wetted and grout placed in the usual manner before the concrete operation is continued.

10. PREPARATION FOR PLACING

- A. Water shall be removed from excavations before concrete is deposited. Any flow of water shall be diverted through proper side drains and shall be removed by methods which will avoid washing over the freshly deposited concrete. Hardened concrete, wood chips and shavings and other debris shall be removed from the interior of the forms, and all hardened concrete and foreign materials from the inner surfaces of the mixing and conveying equipment.
- B. Wood forms, unless lined, shall be oiled or, except in freezing weather, wetted with water in advance of pouring so that joints will tighten and prevent seepage of cement grout from the mix. All dry ground surfaces which are to receive concrete shall be thoroughly sprinkled with water before the concrete its deposition.
- C. Reinforcement and all embedded items shall be secured in position, inspected and approved by the Architect-Engineer before starting the pouring of concrete.
- D. Runways, chutes, light facilities and all equipment to be used in placing concrete shall be in place and approved by the Architect-Engineer before placing operation begins. In placing concrete for arch and curved roof slabs standby equipment shall be provided to insure continuity of operations.

11. TYPES OF CONCRETE

A. Type AA Concrete

Type AA concrete shall be used for the curved concrete roof structure. In addition to other requirements of these Specifications, the time of decentering will be a controlling factor in the proportioning of Type AA concrete. The Contractor is advised to consider the use of high-early-strength cement in order that the concrete will develop adequate strength as early as possible so that the centering can be moved and used again with minimum loss of time. For design purposes, the compressive strength of Type AA concrete shall be 3760 p.s.i.

B. Type A Cenarete

Typo A converte shell be proceed beams, pedestals, iso rink floor and all other structural members. For design purposes, the compressive strength of Type A concrete shall be 3,000 p.s.i.

C. Type B Concrete

Type B concrete shall be used for slabs on ground and ise rink sub-floor only. For purposes of design, the compressive strength of type B concrete shall be 2500 p.s.i.

D. Type C Concrete

Type C constrete is a light-weight constrete, otherwise referred to as "Vermiculite". This constrete shall be used for cants, roof fill and as shown on the Drawings.

12. TESTS AND STRENGTH REQUIREMENTS

A. Slump

The consistency of the consistency shall be determined by secasional tests in conformity with "Method of Slump Tests for Consistency of Portland Cement Consistency, A.S.T.M. designation C 143-59, and shall conform to the following requirements:

- (1) Footings, arches and ourved roof slab two (2) to four (4) inches.
- (2) Other structural members four (4) to six (6) inshes:
- (3) The consistency of the concrete, as specified above, may be modified with the consent of the Architect-Engineer.

B. Compressive Strength

(1) Concrete strength tests shall be in accordance with American Society for Testing Materials Standard Method C-39-Who. When so tested, the concrete shall meet the following requirements in 28 days.

Minimum Average for Any 5 Consecutive Cylinders 1 Cylinder

Type of Concrete Pounds per sq. in. Pounds per sq. in.

AA	3750	3100
A	3000	21,00
B	, 2500	2000

(2) If with the approval of the Architect Ingineer, the time of curing the test specimens is reduced to 7 days in lieu of 28 days, the required minimum strengths of the concrete specimens shall be not less than 65 per cent of the 28-day strength. Concrete made with high-early-strength cement shall have a 7-day compressive strength equal to the specified minimum 28-day compressive strength for concrete of the type specified made with ordinary portland cement.

C. Decentering Tests

Before decentering, the concrete shall have developed a modulus of elasticity of two million (2,000,000) p.s.i., as determined on test beams by the Architect-Engineer, and shall have developed a compressive strength, as determined by cylinder tests, of twenty-five hundred (2500) p.s.i. Thus the time of the decentering of the roof structure shall be dependent entirely on the strength and elastic properties of the concrete as determined by these tests. Therefore, these requirements for decentering may have an important bearing on the design of the mix and the use of high-early-strength cement.

D. Test Specimens

- (1) Test cylinders shall be taken from the concrete in accordance with the Standard Method of Making and Guring Concrete Compression and Flexure Test Specimens in the Field (A.S.T.M. Designation: C-31-44) as it is being deposited in the forms.
- (2) One concrete cylinder specimen shall be taken for each 50 cu. yd. of concrete, Types "A" and "B".
- (3) Ten concrete cylinder specimens shall be taken during each pour of the curved roof structure. Two of these cylinders shall be used for 28-day compressive strength tests and the others shall be used to determine the decentering time and 7-day strength.

- (4) On small pours the requirements for cylinder specimens may be waived by the Architect-Engineer.
- (5) During cold weather placing additional cylinder specimens shall be taken as directed by the Architect-Engineer.
- (6) During each curved roof placing operation these test beams shall be prepared from concrete as it is being deposited in the forms.
- by six (6) inches

 (7) These test beams will measure four (4) inches/and will be
 four (4) feet six (6) inches long, and will be reinforced
 with four (4) one-quarter (1/4) inch round bars. On
 these beams the representative of the Architect-Engineer
 will check the elastic properties of the placed concrete
 and determine the time for decentering the curved roof.

In Mir Content lests

The air content of the concrete shall be determined in accordance with A.S.T.M. designation C138, latest edition. An apparatus shall be used to determine the air content of the concrete by the pressure method. Other methods giving comparable results may be used for field control if approved the Architect-Engineer. The air content as measured in the Field shall be less than six per cent (6%) and more than two per cent (2%).

- F. Responsibility for Tests and Sampling
 - (1) Compressive strength tests shall be made by an agency approved by the Architect-Engineer.
 - (2) Slump tests shall be made by the Contractor under the direction of the Architect-Engineer.
 - (3) All cylinder specimens, test beams and other samples of concrete shall be prepared by the Contractor, using methods approved by the Architect-Engineer and as specified in this section of the Specifications. The Contractor shall bear the costs of all tests except the beam tests.

13. PROPORTIONING OF CONCRETE

A. Minimum Cement and Maximum Water Content

(1) Regardless of other requirements of these Specifications, the cement and water content shall satisfy the following requirements:

Type of Concrete	Minimum Per Cu. of Concr (bags) (Yd.	Maximum Water Per Sack of Cement (gallons)
AA	6.25	588	6
A	5.5	517	7_
В		470 MA	72.46

- (2): Where necessing to satisfy office requirements of liece to specifications, the contractor shall add more than the above mentioned amounts of cement or use less water.
- (3) The concrete shall be proportioned by weight. The strength requirements, the slump requirements, workability, durability and weather resistance qualities of the concrete shall be governing factors.

B. Design of Concrete Mixes

- (1) The Contractor shall be responsible for correctly designing concrete mixes so as to provide workable concrete conforming to all requirements of these specifications.
- (2) Every effort shall be made to secure a concrete having a minimum shrinkage during setting, and at the same time a concrete which can be thoroughly worked around and put in close contact with the reinforcing rods and embedded metal. In general, in proportioning the aggregates for concrete, the quantity of fine aggregate will not be more than the quantity of coarse aggregate, nor will the quantity of fine aggregate be less than half the quantity of coarse aggregate, in any batch.
- (3) The concrete shall be proportioned by weight. The strength requirements, slump requirements, workability, durability, weather resistance qualities of the concrete and minimum cement content shall be governing factors.
- (4) For each type of concrete the Contractor small prepare a trial batch conforming to the preliminary mix design and determine the 7-day compressive strength in accordance with the requirements of the ASTM Standard Methods C-31-lili and C-39-lili. These tests shall be made by an approved agency and the reports shall be submitted to the Architect-Engineer for approval before the concrete work on the stadium is begun.

(5) A mix design shall be submitted to the Architect-Engineer for approval at least 2h hours before each concrete placing operation. No concrete mix shall be used without the approval of the Architect-Engineer.

C. Air Entrainment

- (1) Air-entraining concrete shall be used for the curved roof system, the ice rink floor and sub-floor and for all parts of the structure having exterior faces exposed to the earth or to the weather. Where air-entraining concrete is required, the air content shall be not less than two per cent (21) and not greater than six per cent (65). The Contractor may use air-entraining concrete in any other part of the structure if he desires to do so.
- (2) The last entraining may be accomplished of thereby the ACC of the contraining again the USE of the contraining Portland Cements conforming to the requirements of these specifications.

D. Measurement of Cement

Coment shall be measured by weight on a scale separate from those used for other materials. The Contractor shall provide weighing equipment of sufficient capacity to weigh all coment required for a batch in one operation. The error of the cement-weighing mechanism shall not exceed one per cent (1%) of the amount of material weighed. When approved by the Engineer, cement may be measured in full bags of 9h lbs. each, but no fraction of a bag shall be used unless weighed. Either the entire contents of the weighing hopper or the entire contents of the measured number of bags shall be completely delivered into the concrete mixer.

E. Measurement of Aggregates

The quantities of aggregate required for each batch of concrete shall be measured by weight. Due allowance shall be made for the moisture carried by the aggregates. The Contractor shall provide weighing equipment of sufficient capacity to weigh all fine and coarse aggregates required in a batch in one filling of the weighing hopper. No concrete work shall be performed until the weighing equipment has been approved by the Engineer. Weighing equipment shall be of such construction and accuracy that it will rapidly measure without delay the aggregates required in each batch. The percentage of error of the weighing mechanism shall not exceed one per cent.

F. Measurement of Water

The quantity of water required for each batch of concrete shall

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be accurately gauged either by weight or by volume, and the Contractor shall provide an approved measuring and controlling device therefor. Due allowance shall be made for the moisture carried by and weighed with the aggregates. The water measuring device shall be equipped with inlet and discharge valves so interconnected that either one or the other but not both may be operative at any time and both valves shall be free from leakage when in a closed position. Volumetric measuring devices shall have either an adjustable overflow outlet or an adjustable discharge outlet, each calibrated to indicate the amount of water measured. Weight measuring devices shall be of either the simple or compound lever type, free from springs, and calibrated to indicate the amount of water measuring device shall not exceed one per cent of the amount of water measured.

14. MIXING OF CONCRETE

A. General

The rated capacity of any mixer shall be 1/2 cu. yd. or more.

- (1) Mixers shall not be charged in excess of the rated capacity, nor be operated in excess of the rated speed. Excessive mixing, requiring the addition of water to preserve the required consistency, will not be permitted. The entire batch shall be discharged before recharging.
- (2) Mixing time shall be measured from the instant when the water is introduced into the drum containing all solids. All mixing water shall be introduced before 1/4 of the mixing time has elapsed. Mixing time for mixers of 1 cubic yard or less shall be 1-1/h minutes; for mixers larger than 1 cubic yard, the mixing time shall be increased 15 seconds for each additional hard cubic yard or fraction thereof.
- (3) Unites waived by the Architect-Engineer, a lock to lock the discharge mechanism until the required mixing time has elapsed, shall be provided on each mixer.

B. Ready-Mixed Concrete

Ready-mixed concrete may be used, subject to approval by the Architect-Engineer. Ready-mixed concrete shall be plant-mixed or truck-mixed as specified below. Concrete delivered in an atmospheric temperature lower than 10 degrees F shall have a temperature of not less than 60 degrees F. The storing, weighing, batching and mixing requirements specified herein for storing, batching and mixing at the site, except as hereinafter modified, shall apply to ready-mixed concrete. The Architect-Engineer and representatives of the Owner shall have free access to the mixing plant at all times.

C. Plant-Mixed Concrete

The plant shall be equipped for the accurate proportioning, mixing, and delivery of the concrete and have sufficient capacity and transportation facilities to deliver the concrete at the rate required. Concrete shall have an initial mixing at the plant of not less than one minute after all materials are in the mixer. The time elapsing between the discharge of the concrete from the mixer to its final position shall not exceed I hour unless otherwise approved by the Architect-Engineer. Transportation of concrete from the plant to the job shall be in clean water-right receptacles equipped with an agitation device which shall operate until the concrete is discharged. Maximum size of batch carried shall be not more than 70 per cent of the rated capacity of the container (for agitation) and the agitating speed shall be not less than 2 revolutions per minute or more than 6 revolutions per minute of the drum or revolving agitating device.

D. Transit-Mixed Concrete

Materials shall be batched and discharged into the truck-mixer and agitator which shall be capable of transporting and mixing the separate ingredients into a thoroughly mixed and uniform mass, while in transit. The quality and characteristics of the mix shall conform in every respect to the requirements for concrete mixed at the site. Concrete shall be delivered to the mite within 1 hour after the addition of mixing water. The number of revolutions of the mixer shall be not less than a revolutions of the drum per minute, nor greater than a peripheral velocity of 225 feet per minute. Any additional mixing shall be not more than 250 revolutions at mixing and agitating speed combined. The agitating speed for any type of transit mixer shall be not less than 2 nor more than 6 revolutions per minute. Truck mixers generally shall be operated within the limits of the capacity and speed of rotation designated by the manufacturer.

- (1) The transit mixer shall be equipped with a device for recording the number of revolutions made by the drum between time of charging with material and delivery of the concrete at the site.
- (2) The transit mixer shall be fitted with a locking device to prevent additions to or subtraction from the mix en route, and to provide means for the identification of each vehicle.
- (3) The mixing and flushing waters in truck mixers shall be in separate compartments arranged so that the drum cannot be flushed until the mix has been dumped. The mixing water compartment shall be equipped with a calibrated glass guage.

15. CONVEYING OF CONCRETE

Concrete shall be conveyed from mixer to forms as rapidly as practicable by a method which will prevent segregation or loss of ingredients. Belt conveyors, chutes, or similar equipment can be used only as approved by the Architect-Engineer.

16. PLACING OF CONCRETE

A. General

- (1) Concrete shall be handled from the mixer or transport vehicle to the place of final deposit in a continuous manner, and as rapidly as practicable, until the given unit of operation, approved by the Architect-Engineer, is completed.
- (2) Concrete that has attained its initial set, or has contained its water content for more than 1 hour, shall not be deposited in the work.

- (3) The concrete shall be deposited in the forms as nearly as practicable in its final position, so as to avoid rehandling. Special care shall be exercised to prevent splashing the forms or reinforcement with concrete in advance of pouring.
- (4) Immediately after depositing, the concrete shall be compacted by thoroughly agitating the mastic mass in a manner approved by the Architect-Engineer that will force out all air pockets and work the mixture into corners, around reinforcement and inserts, and prevent the formation of voids.
- (5) Concrete shall not be placed on concrete which has hardened sufficiently to cause the formation of seams and planes of weakness within the section.
- (6) Concrete shall not be allowed to drop freely more than 5 feet in unexposed work more more than 5 feet in exposed work mices otherwise approved by the Architect-Engineer. Where greater drops are required, a tremie or other method should preferably be employed as approved by the Architect-Engineer. The discharge of the tremie shall be controlled so that the concrete may be effectively compacted into horizontal layers not exceeding 18 inches in thickness with a minimum of lateral movement.
- (7) The arches and curved roof system shall be poured in a continuous monolithic pour. Each roof unit shall be poured symmetrically, starting at the construction joints near the spring lines of the curved roof.
- (8) A suitable method of screeding the curved roof slab to the thicknesses shown on the Drawings shall be submitted by the Contractor and approved by the Architect-Engineer before concrete placing operations are begun on the curved roof system. This approved method shall be used in screeding the curved roof slab.

* B. Chute Placement

When concrete is conveyed by chutes, the plant and equipment shall be of such size and design as will ensure a continuous flow of concrete in the chute. The chute shall be of metal or metal-lined wood, and the different portions shall be set at approximately the same slope, which shall be not less than 1 vertical to 3 horizontal, nor more than 1 vertical to 2 horizontal. The discharge end of the chute shall be provided with a baffle plate to prevent segregation. If the height of the discharge end of chute is more than 3 times the thickness of the layer being deposited, but not more than 5 feet above the surface of the concrete in the forms, a spout shall be used, and the lower end maintained as near the surface of deposit as practicable. When the pouring operation is intermittent, the chute shall discharge into a hopper. The chute shall be thoroughly cleaned before and after each run. All waste material and the

- (3) The concrete shall be deposited in the forms as nearly as practicable in its final position, so as to avoid rehandling. Special care shall be exercised to prevent splashing the forms or reinforcement with concrete in advance of pouring.
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- (8) A suitable method of screeding the curved roof slab to the thicknesses shown on the Drawings shall be submitted by the Contractor and approved by the Architect-Engineer before concrete placing operations are begun on the curved roof
- system. This approved method shall be used in screeding the curved roof slab.

B. Chute Placement

When concrete is conveyed by chutes, the plant and equipment shall be of such size and design as will ensure a continuous flow of concrete in the chute. The chute shall be of metal or metal-lined wood, and the different portions shall be set at approximately the same slope, which shall be not less than 1 vertical to 3 horizontal, nor more than 1 vertical to 2 horizontal. The discharge end of the chute shall be provided with a baffle plate to prevent segregation. If the height of the discharge end of chute is more than 3 times the thickness of the layer being deposited, but not more than 5 feet above the surface of the concrete in the forms, a spout shall be used, and the lower end maintained as near the surface of deposit as practicable. When the pouring operation is intermittent, the chute shall discharge into a hopper. The chute shall be thoroughly cleaned before and after each run. All waste material and the

flushing water shall be discharged outside of the forms.

C. Compaction

- (1) Concrete shall be placed in layers not over 18 inches deep and each layer shall be compacted with the aid of mechanical internal vibrating equipment supplemented by hand-spading, rodding and tamping as directed by the Architect-Engineer.
- (2) Vibrators shall in no case be used to transport concrete inside the forms. Internal vibrators shall maintain a speed of not less than 6,000 impulses per minute when submerged in the concrete. At least one spare vibrator shall be maintained as standby equipment.
- (3) The duration of vibration shall be limited to decene necessary to produce satisfactory consolidation without causing objectionable segregation and shall be at least 20 seconds per square foot of exposed surface.
- (4) The vibrator shall not be inserted into lower courses that have begun to set. Vibrators shall be applied at uniformly spaced points not farther apart than the visible effectiveness of the machine.

D. Cold-Weather Placement

- (1) Concrete shall be mixed and placed only when the temperature is at least 40 degrees F and rising, unless permission to pour is obtained from the Architect—Engineer, in which event all material shall be heated and otherwise properly prepared so that batching, mixing and placing can proceed in full accord with the following provisions.
- (2) Suitable means shall be provided for maintaining the concrete at a temperature of at least 50 degrees F for a period of 72 hours after placing, except that where high-early-strength cement is used, this period may be reduced to 24 hours.
- (3) The methods proposed for heating the materials and protecting the concrete shall be approved by the Architect-Engineer. Precautions shall be taken against overheating of the concrete which would cause a flash set to occur.

(h) Salt, chemicals, or other materials shall not be mixed with the concrete for the purpose of preventing freezing. Accelerating agent shall not be used except when it is necessary to pour concrete in existing or probable temperature of between 25 and hO degrees F. Accelerating agent shall be introduced into the concrete in a proportion not exceeding 3 percent by weight of the cement, and shall be used only when approved by the Architect-Engineer.

E. Hot-Weather Placement

During hot weather concrete shall be delivered to the forms at the coolest practicable temperature. Concrete placement will not be permitted, when in the opinion of the Contracting Officer the sun, heat, wind or humidity prevents the proper placement.

F. Foundation Placement

- (1) Concrete footings shall be placed true to dimensions shown on Drawings upon undisturbed clean surfaces, free from frost, ice, mud, standing or running water.
- (2) Foundations shall be excavated to a depth satisfactory to the Architect-Engineer.

G. Placement of Architectural Concrete

- (1) In all architectural concrete construction special care shall be taken to produce a concrete surface free of honey-combing or discoloration.
- (2) The concrete shall be placed with the use of metal tremies, the bottom of which shall be maintained at a height of one foot or less above the surface of the deposited concrete.
- (3) The vibration of the concrete shall be supplemented by rodding or spading, especially at angles and corners, where such additional compaction is necessary to produce smooth surfaces and sharp, clean corners.
- (4) No vibration shall be withdrawn from the deposited concrete until the power has been shut off and the vibrator has ceased turning.
- (5) Concrete shall be placed between joints and mouldings in one continuous placing operation. Construction joints must neatly coincide with scoring in the architectural pattern as shown on the Drawings.

H. Placement of Slabs on Ground

(1) Before proceeding to construct concrete slabs on ground,

all pipes under concrete floors on ground shall have received the required tests. The sub-grade shall be brought to a true even plane, and compacted to a solid bearing as specified under Section 2 of these Specifications.

(2) The concrete shall be of comparatively dry consistency and shall be screeded level or to the required grades. After compacting, the surface shall be prepared to receive the required type of finish treatment specified.

I. Bonding and Grouting

- (1) Before depositing new concrete on or against concrete which has set, the existing surfaces shall be thoroughly roughened and cleaned of all laitance, foreign matter and loose particles. Forms shall be re-tightened and the existing surfaces slushed with a grout cost of next cement.
- (2) The new concrete shall be placed before the grout has attained its initial set. Grout for construction joints shall be of cement and fine aggregate in the same proportion as the concrete to be placed, and shall be from 1/2 to 1 inch in thickness.

17. FINISHES OF CONCRETE OTHER THAN FLOOR SLABS AND ROOF

A. General

- (1) Prior to any other treatment, all surfaces produced by forms and exposed to the sight shall be finished by filling depressions, trimming bellies and removing form marks, fins or other projections.
- (2) All discoloration shall be removed from exposed surfaces.
- (3) Any concrete having honeycombing or serious defects shall be patched in accordance with Article 22 of this Section of these Specifications.

B. Cleaning

- (1) The following surfaces shall be cleaned with grout as specified in paragraphs (2) and (3):
 - (a) All of the exposed concrete surfaces on the outside of the structure.
 - (b) All surfaces of the lobby and marquee structure which are to be exposed.
 - (c) All exposed surfaces in the promenade area, such as the columns, walls and ceiling.
- (2) Cleaning shall be done with a grout consisting of 1 part Portland cement to 1 parts of fine sand with sufficient water to produce the consistency of a paint. Part of the cement, as directed by the Architect-Engineer, shall be white Portland cement.
- (3) The grout shall be rubbed on the concrete surface with burlap bagging, which has been dipped into the grout.

 After the grout has dried sufficiently, the surface shall be rubbed again with dry burlap bagging.

18. CONCRETE FLOOR FINISHES

- A. All surfaces which are to be left exposed shall be struck off at required levels and finished by one of the following methods as indicated on the Drawings:
 - (1) "Wood Float": The concrete shall be floated with a hand or power float, as approved by the Architect-Engineer.
 - (2) "One Steel Trowel": The concrete is floated as above and trowelled one time with a steel trowel.
 - (3) "Two Steel Trowel": The concrete is finished as for "One Steel Trowel." After the concrete has set sufficiently, the surface shall be given a second trovelling to produce a smooth surface.
- B. All areas which are to receive a wearing surface of rubber tile or asphalt tile, as noted on the Drawings, shall be finished by hand or power floating and steel trowelling.
- C. All areas which are to receive a wearing surface of ceramic tile or terrazzo, as noted on the Drawings, shall be struck off at required levels and floated with hand or power floats.
- D. All floor areas which are to receive a terrazzo finish shall be depressed as shown on the Drawings.
- E. Ice rink sub-floor concrete shall be screeded to required level and float finished, ready to receive ice rink floor.

19. CONCRETE FLOOR HARDENER

- * Concrete floor hardener shall be applied in accordance with the manufacturer's directions to the following surfaces:
 - (1) All floor surfaces not to receive a tile or terrazzo finish.
 - (2) All exposed horizontal surfaces of the bleachers.
 - (3) All other walking and wearing surfaces, such as stair treads, stair landings, etc.

20. CONCRETE ROOF FINISHES

A. General

- (1) The top surfaces of concrete roof slabs shall be screeded with straight edges to the correct thickness as shown on the Drawings and shall be float finished. The finished surface shall be smooth and hard, containing no depressions or projections.
- (2) Where lightweight concrete fill (or "Verniculite") is to be placed, the roof slab shall be screeded but need not be floated.

B. Curved Roof Structure

- off in a convex curve or sloped for drainage as shown on the drawings and given a steel troweled finish.
 - (2) The curved roof slab shall be screeded to thicknesses shown on the Drawings and finished with a wood float.
 - (3) If, after the concrete has been cured, irregularities or depressions occur, the Contractor shall fill them with a bituminous mastic filler approved by the Architect-Engineer.
 - (4) If mastic filler is required, it must be applied in accordance with the manufacturer's directions, giving proper attention to curing.
 - (5) Before the mastic is applied to the roof, sample patches shall be made to test for soundness.

21. PROTECTION AND CURING

A. General

- (1) Forms shall be left in place on exposed surfaces for a reasonable length of time for better curing and protection.
- (2) The Contractor shall have available adequate equipment and materials, such as tarpaulins, for the protection of freshly poured concrete during rainstorms or other exigencies.

B. Curing

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(1) Concrete surfaces covered by forms shall be protected against loss of moisture by keeping the

forms sufficiently wetted with clean water to reduce cracks and to prevent the joints in forms from opening and, prevent hair cracks from occuring in surface of the concrete. During damp periods this water curing routine shall be maintained, except that the amount of water used shall be sufficient to Keep only the forms moist.

- (2) Surfaces from which forms are removed before the curing period has elapsed, shall be protected as specified for surfaces not covered by forms.
- (3) Immediately after placing or finishing, concrete surfaces not covered by forms shall be protected from the loss of surface moisture for a period of not less than 7 days where a normal portland cement has been used, or 3 days where a high-early-strength portland cement has been used.

(4) Water Curing

The curing of the exposed concrete can best be effected by covering the surfaces with wet quilts or wet burlap. The quilts or burlap shall be kept moist throughout the curing period. The kraft paper, if used, shall be effectively sealed at all edges and laps and weighted to prevent blowing away.

(5) Membrane-Compound Curing

At the Contracter's option, curing compound may be used in lief of the water-curing method mestioned in paragraph 4.

The curing compound shall be applied as soon as surface water has disappeared and any required floating or troweling has been done, strictly in accordance with the manufacturer's directions, in sufficient thickness to form an effective water seal, but in conformance with the following requirements:

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- (a) Membrane curing shall not be used on surfaces that are to receive additional concrete or concrete fill, nor on cement finish coats that are to receive dust-proofing and hardening treatments.
- (b) The curing compound shall be delivered to the job in the manufacturer's original container which shall be marked with the manufacturer's name and the trade name of the material.
- (c) Curing compounds, if used, shall be thoroughly agitated during use, and shall be uniform-

ly sprayed, in a single coat, by approved spraying equipment, on all concrete durfaces at a rate not to exceed 200 square feet pergallon in place.

- (d) If concrete surfaces have become dry, they shall be thoroughly moistened with water, immediately before application of the compound.
- (e) If, in the opinion of the Architect-Eagineer discontinuities or pin-holes exist, a second soat shall be immediately applied to the affected areas.
- (f) The membrane method of curing shall not be used when the air temperature is above 90°.

 Pahrenheit or is likely to use above 90°.

 Fahrenheit.
- (g) Where the membrane method is used, the membrane shall not be disturbed or broken.

22. PATCHING

- A. Immediately after stripping the form work, all defective areas shall be patched and holes filled. The areas shall be chipped away to a depth of not less than one (1) inch with the edges regular and perpendicular to the surface. The area to be patched, including the area surrounding it, shall be thoroughly wetted just prior to placing the patching mortar.
- B. The mortar shall be of the same material and proportions as used for the concrete except that the coarse aggregate shall be removed and a sufficient quantity of white cement substituted for a part of the gray cement so that the patching mortar when dry will match the surrounding concrete. To insure that a proper match be obtained between the patching mortar and the surrounding concrete, a series of test samples shall be made with varying proportions of white and gray cement, for approval of the Architect-Engineer:
- C. Only sufficient water necessary for handling and placing sharl be used. The mortar shall be retempered without the addition of water by allowing it to stand for a period of approximately one hour prior to use during which time it shall be mixed to prevent setting. The mortar shall be thoroughly compacted into place and screeded so as to leave the patch slightly higher than the surrounding surfaces. It shall be left undisturbed for a period of from one to two hours to permit initial shrinkage after which it shall be finished to match the adjoining work.
- D. Where patches exceed one (1) inch in depth they shall be trimmed and wetted as herein described after which the opening shall be filled to within one (1) inch in depth of the surface. After sufficient time for shrinkage has elapsed the patching shall proceed as herein described. All patches shall be kept wet for a period of at least seven (7) days.
- E. Holes left by rods or ends of ties shall be filled solid with mortar. For holes passing entirely through the wall a plunger type grease gun or other device shall be used to force the mortar through the wall, starting at the back face.
- F. A piece of burlap or canvas shall be held over the hole on the outside and when the hole is completely filled, the excess mortar shall be struck off with the cloth, flush with the surface. Holes not passing entirely through the wall shall be filled with a small tool that will permit filling the hole solid with mortar. A ny excess mortar at the surface of the wall shall be struck off flush with a cloth.

23. LIGHTWEIGHT CONCRETE FILL

A. Use

Lightweight concrete fill shall be used for crickets and cants, and wherever "Vermiculite" is indicated on the Drawings.

B. Proportion

Lightweight concrete fill shall be composed of one part Portland Cement and six parts of lightweight aggregate, and water added as approved by the Architect-Engineer. All measurements shall be by volume. The unit of measurement shall be the cubic foot. All materials shall be measured dry. The above proportions shall produce a density of approximately 36 lb. per cubic foot.

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The materials shall be mixed in an approved mechanical batch mixer. The water shall be added to the lightweight aggregate and mixed thoroughly. Then the cement shall be added and the whole thoroughly mixed until the proper consistency results (as approved by the Architect-Engineer).

D. Placing

The mixture shall be placed immediately after mixing on thoroughly broom-cleaned surfaces. Where possible, it shall be leveled with a straightedge between grade points so that all slopes run to required levels.

24. PRECAST ITEMS

- A. Items to be precast, or those items which the Contractor has the choice of precasting or casting in place, are as shown on the Drawings or as indicated in the applicable portions of the Specifications. All precasting shall be done in accordance with best modern practice. Particular attention is called to methods of picking up precast units when placing in their final positions. Any members cracked or damaged which, in the opinion of the Architect-Engineer, cannot be safely rejoined, shall be replaced by the Contractor at no additional cost to the Owner.
- B. Joints between precast items, such as bleacher sections or wall units, shall be filled with mortar as specified in Section 5 of these Specifications, with proper attention to matching the surrounding concrete. (See paragraph 22-B)

25. TILT-UP WALLS

- A. If the Contractor chooses to precast the serrated walls along the north and south sides of the structure, they shall be cast in a horizontal position on the lean-to slab occurring at elevation plus twelve in such a manner that they need only be tilted upward into final position.
- B. After the wall units are in final position the space at the top and bottom of the units shall be filled with mortar as specified in Section 5 of these Specifications, and all exposed joints properly caulked with cement colored caulking compound as specified in Section 23 of these Specifications.

26. ICE RINK SUB-FLOOR

The ice rink sub-floor is Type B concrete, screeded with straight-edges, dead level, and wood-float finished.

SECTION NO. 4 - STRUCTURAL STEEL

The "General Conditions Governing All Contracts" and the "Specific Requirements for Contract No. 1" shall apply to all work of this Section.

1. SCOPE

The work covered by this Section of the Specifications consists in furnishing all plant, labor, equipment, appliances and materials and in performing all operations in connection with the installation of structural steel, complete, as shown on the Drawings, as herein specified, or as reasonably inferable from the Drawings and Specifications, generally as follows:

- A. All structural steel framing, including framing for end walls and catwalks.
- B. W. Installation of inserts for end wall hangers.
 - C. Necessary bearing connections, pins, anchors, bolts, river
 - D. Painting one shop coat.
 - E. Related work not included consists of Field Painting and Inserts furnished under Miscellaneous Metals.

2. GENERAL

A. Codes

The current rules and practices set forth in the Code of Standard Practice for Steel Buildings and Bridges, and the Specifications for the Design, Fabrication and Brection of Structural Steel for Buildings of the American Institute of Steel Construction, shall govern this work, except as otherwise specified, or as otherwise specified on the Drawings. Welding shall be in accordance with the current Code for Arc and Gas Welding in Building Construction of the American Welding Society.

B. . Shop Drawings

Shop drawings shall be submitted to the Architect-Engineer for approval. Material fabricated or delivered to the site before approval of the shop drawings shall be subject to rejection by the Architect-Engineer.

C. Design

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The design of connections for any portions of the structure not indicated on the design drawings shall be completed by the fabricator. Such design shall conform to the requirements of the current issue of the Specifications for the Design, Fabrication, and Erection of Structural Steel Buildings of the American Institute of Steel Construction. The design Drawings shall be submitted to the Architect-Engineer for approval before any material is fabricated. Subsequent to approval by the Architect-Engineer, no changes or modifications shall be made without his consent.

D. Inspection

The material to be furnished under this Specification shall be subject to inspection and tests in the mill, shop and field by the Owner's representative or the Architect-Engineer. Such inspection and tests will be conducted without expense to the Contractor; however, inspection by the Architect-Engineer in the mill or shop shall not relieve the Contractor of his responsibility to furnish satisfactory materials, and the Architect-Engineer reserves the right to reject any materials at any time before final acceptance of the building, provided the materials and workmanship do not conform to the specified requirements in the opinion of the Architect-Engineer.

E. Mill Reports

The Centractor shall furnish, without extra cost to the Gwner, two certified copies of all mill reports covering the chemical and physical properties of the steel used in the work under this Specification.

F. Substitutions

Substitutions of sections, or modifications of details, or both, shall be made only when approved by the Architect-Engineer.

G. Errors

The Contractor shall be responsible for all errors of fabrication and for the correct fitting of the structural members shown on the drawings, including the approved shop drawings.

H. Use of Templets

The Contractor shall use templets for the setting of anchors and bearing plates and shall make certain that the items are properly set during the progress of the work.

3. MATEXIALS

- A. Structural steel shall conform to the requirements for open hearth steel of the Standard Specifications for Structural Steel for Bridges and Buildings, A.S.T.M., Serial Designation A7, latest edition.
 - (1) Rivet steel shall conform to the Standard Specifications for Structural Rivet Steel, A.S.T.M., Serial Designation Al41, latest edition.
 - (2) Steel for pins shall conform to the Standard Specifications for Carbon Steel Forgings for General Industrial Use, A.S.T.M., Serial Designation A255, Class C, latest edition.

B. Stock Material

Stock material shall be of a quality equal to that called for in Paragraph 3A above. Mill test reports will constitute a sufficient record for material taken from stock. Unidentified stock material, if free from surface imperfections, may be used for short sections of minor importance or for small unimportant details, where the precise physical properties of the material would not affect the strength of the structure. The Architect-Engineer reserves the right to reject any materials at any time before final acceptance of the building, provided the materials and workmanship do not conform to the specified requirements in the opinion of the Architect-Engineer.

4. FABRICATION

A. Workmanship

The workmanship and finish shall be first class and equal to the best practice in modern structural shops. Shearing and clipping shall be neatly done, and all portions of the work exposed to view shall be neatly finished. All deformed structural material shall be properly straightened, by methods which are non-injurious, prior to being laid off, punched or otherwise worked in the shop. Sharp kinks or bends shall be cause for rejection.

B. Riveted and Bolted Connections

All shep connections shall be power riveted unless otherwise shown on the drawings or where the use of riveting tools is impractizable. Where riveting tools cannot be used, turned belts in reamed heles or rivet belts may be substituted, if approved by the Architect-Engineer, except that no combination of rivets, belts, or rivet belts shall be used in the same face of any connection.

C. Welded Commetions

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Welded Connections will be permitted only as indicated on the Drawings or as specifically authorised by the Architect-Engineer.

D. Holes

Holes shall not be made or enlarged by burning. Holes shall be provided in members to permit connecting the work of other trades whose responsibility it shall be to furnish the necessary information as may be required. No holes larger than rivet holes shall be installed in structural steel unless approved in writing by the Architect-Engineer. If the installation of such holes is approved, the surrounding steel shall be properly reinforced when necessary.

E. Fastenings in Tension Members

Buts for bolts in tension shall be of an approved self-locking type. Other bolts shall have self-locking nuts or lock washers.

5. BRECTION

A. General

Because of the possibility of slight vertical movement of the end arches due to temperature changes and other effects, the procedure to be followed for the erection of the structural steel of the end wall shall be subject to approval by the Architect-Engineer.

- (1) The Contractor shall keep all staging and false work in a safe condition, and shall provide such temporary means of inspection as the Architect-Engineer may direct during construction and prior to the final acceptance of the structure.
- (2) The Contractor shall unload and store material in a careful systematic way to prevent injury from rust or other causes and to prevent loss of minor pieces. No stored material shall at any time be permitted to rest upon the ground, or in water, or without proper skids.

B. Drift Pins

Drift pine may be used only to bring together the several parts; they shall not be used in such a manner as to distort or damage the metal.

G. Twist Drilling

Twist drilling and reaming will be permitted provided the members are not weakened and the holes can be properly filled.

D. Gas Cutting

The use of a gas cutting torch in the field for correcting fabrication errors will not be permitted on any major members in the structural framing. Its use will be permitted on minor members not under stress at the time, and then only after approval of the Architect-Engineer has been obtained.

E. Field Conditions

Unless otherwise specified on Drawings, field connections shall be in accordance with the requirements of the A.I.S.C. Specification. No combination of rivets, belts or rivet belts shall be used in the same face of any connection.

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- (1) Field bolts in work which will be exposed to the weather upon completion shall be dipped in red lead paint just before they are put in place.
- (2) Welded connections will be permitted only as indicated on the Drawings or as specifically authorised by the Architect-Engineer.

6. BEOP PAINTING

A. Surfaces to be Painted

Excepting surfaces to be encased in concrete, machined surfaces and the surface areas within four (4) inches of field welds, all surfaces of steelwork before leaving the shop shall be given one coat of shop paint.

B. Mirria

Faint shall be mixed in the proportion of twenty-five (25) pounds of dry red lead to two-thirds (2/3) of a gallon of raw linseed oil and one-third (1/3) of a gallon of boiled linseed oil. Red lead shall conform to the requirement for ninety-five per cent (95%) grade red lead of the Standard Specifications for Red Lead (A.S.T.M. Designation: D83-41) of the American Society for Testing Materials. Raw linseed oil shall conform to the requirements of the Standard Specifications for Raw Linseed Oil (A.S.T.M. Designation: D234-28) of the American Society for Testing Materials. Boiled linseed oil shall conform to the Standard Specifications for Boiled Linseed Oil (A.S.T.M. Designation: D260-35) of the American Society for Testing Materials.

C. Workmanship

Prior to painting, all steel work shall be cleaned thoroughly by proper and effective means of all loose scale, shavings, rust, filings, grease, dirt or other foreign matter.

- (1) Grease and oil shall be removed with naptha.
- (2) In general, the final cleaning before the application of the shop coat shall be done with power driven rotary steel brushes.
- (3) All painting shall be done in dry weather or under cover, and the steel shall be free from moisture or frost when painted.
- (4) All surfaces shall be given a full priming coat.
- (5) Sufficient time for drying shall be allowed prior to further handling, and any surfaces damaged after painting shall be spot painted with the same formula.

- All parts inaccessible after erection shall receive a second shop cost prior to shipment.
- All surfaces in contact shall receive a priming coat prior to assembly.
- Kreetion marks shall be painted on painted surfaces.

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SECTION NO. 5 - MASONRY

The "General Conditions Governing All Contracts" and the "Specific Requirements" for Contract No. 1 shall apply to all work of this Section.

1. SCOPE

The work under this Section shall consist of furnishing all labor, materials and equipment necessary and required to complete all masonry as shown on the Drawings, as herein specified, or as reasonably inferable from the Drawings and Specifications, generally as follows:

- A. Concrete masonry partitions.
- B. Structural facing tile partitions and split tile veneer.
- C. Brick chimney.
- D. Mortar
- E. Preformed expansion joint filler.
- F. Anchors.

2. ITEMS FURNISHED BUT NOT SET

A. Anchor slots - See Section No. 2 - shall be furnished in sufficient time so that there will be no interference with the orderly progress of the work.

- 3. WORK NOT INCLUDED IN THIS SECTION
 - A. Flashing.
 - B. Caulking.

4. MATERIALS

A. Samples

The Contractor shall submit three samples each of concrete masonry units, structural facing tile, anchor slots and anchors to the Architect-Engineer for approval.

B. Delivery, Storage and Handling

(1) All materials shall be so delivered, stored and handled as to prevent the inclusion of foreign materials and the damage of materials by water or breakage.

(2) Package materials shall be delivered and stored in original packages until ready for use. Packages or materials showing evidence of water or other damage shall be rejected. All materials shall be of the respective qualities specified herein.

C. Concrete Masonry Units

- (1) Units shall be purice block as manufactured by the Cinder Concrete Products Company, of Denver, Colorado, or an approved equal.
- (2) Units shall be fully cured prior to delivery and shall have a minimum compressive strength of 700 p.s.i. on the gross area.
- (3) Face dimensions shall be 8 x 16 nominal, with a joint allowance of 3/8 in. Nominal thicknesses shall be 4, 6 and 8 in. as shown on the Brawings.

B. Structural Facing Tile # 10 Post 10

- (1) Structural facing tile for partitions and split tile veneer shall be clear glazed on one or both faces as indicated on the Drawings, and shall be produced from light burning de-aired fire clay.
- (2) Facing tile shall conform to the Standard Specifications of the Facing Tile Institute and to the ASTM Tentative Specification Cl26, latest edition, and shall be "Buff Clear Ceramic Glazed" as manufactured by the Robinson Brick and Tile Company, Denver, or an approved equal.
- (3) Tile shall have 5 x 12 nominal face dimensions and shall have a nominal thickness of 4 in. Scaps or splits shall have a nominal thickness of 2 in. Allowance shall be made for 1/4 in. joints.
- (4) Bullnose returns and split tile shall be used where shown on the Drawings or required by construction conditions.

K. Common Brick

(1) Common brick shall be a hard burned clay or shale brick conforming to ASTN C62, Grade NW.

F. Fire Brick

(1) Fire brick shall be Low Duty Refractory Brick, Type G, conforming with ASTM ClO6.

G. Fine Lining

- (1) Flue lining shall be made from thoroughly fire clay and shall be capable of withstanding corrosive gases and high temperatures. The inner surfaces shall be smoothly finished.
- (2) Flue lining shall be the product of the Robinson Clay Product Company, Akron, Ohio, or an approved equal.

H. Mortar Materials

- (1) Cement shall be Portland coment complying with ASTM C150, latest edition, Type 1. Only one brand of cement shall be used.
- (2) Lime shall be hydrated lime conforming to ASTM C141, latest edition.
- (3) Sand shall conform to ASTM C144, latest edition, graded from fine to coarse as follows:

Passing a No. 4 screen 10% to 30% Retained on a No. 100 screen 10% to 100%

(4) Water shall be clean and free from injurious amounts of oil, acid, alkali, organic or other deleterious matter, or shall be water used for drinking purposes.

I. Fire Clay

(1) Ground fire clay shall be used as mortar for laying-up fire brick or flue lining, and shall conform to ASTM ClO5, Fine Grade, for Low Heat Duty, No. 16F.

J. Expansion Joint Filler

(1) Preformed expansion joint filler shall conform to ASTH D544 (Tentative Revision) for Type 5, bituminous fibre. The filler shall be the proper width and thickness to fill the joint.

K. Anchors

- (1) Anchors for anchorage of ends of partitions to concrete walls, columns, piers, etc., shall be approved dovetail galvanised 1 in. x 1/8 in. metal straps or No. 9 USS ga. galvanised wire insert type of adjustable anchor. Anchor alots shall be No. 26 USS ga. galvanized metal rum vertically and USS ga. galvanized spaced 16 in. o.c. Anchor slots shall be furnished under this Section for installation under Section No. 3, Concrete.
- (2) Ties for anchorage of facing scaps or split tile to concrete masonry units and at partition intersections shall be made of No. 12 USS ga. rust resisting sheets 3/4 in. in width, crimped or corrugated, or with ends bent in hook form. Ties shall be galvanized after forming, using not less than 2 oz. of zinc per sq. ft. of surface galvanized.

5. WORKMANSHIP

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A. Mortar Mixing

- (1) All morter shall be mixed with care and precision. Mixing of morters shall be done preferably in a mechanically operated batch mixer of the drum type, with means for regulating the quantity of water for each batch.
- (2) Hand mixing may be allowed, provided that the quantities of materials and water be controlled and that the method used meets with the

approval of the Architect-Engineer.

- (3) When a batch mixer is used, the materials shall be mixed for a period of two minutes after all materials are in the drum. At the completion of the mixing time, the drum shall be completely emptied before the succeeding batch is placed therein.
- (4) Hydrated lime shall be mixed with water to form putty and stored with reasonable care to prevent evaporation. Hydrated lime putty shall not be used for a period of 24 hours after mixing.
- (5) Mortar shall be freshly mixed and the quantity of each batch shall not be in excess of the amount that will be used before the same has started to set. In no case shall mortar be used more than 30 minutes after water has been added. No retempering of mortar will be permitted. The ingredients of each batch shall be accurately measured and combined in the proportions specified. All mortar for one purpose shall be of the same color and consistency.

B. Mix Proportions

- (1) One bag of Portland cement weighing not more than 94 lbs. shall be taken as one cubic ft.
 - (2) One bag of lime weighing 50 lbs. shall be taken as one cubic ft.
 - (3) Sand shall be measured loose in a box made for the purpose.
- (4) Water shall be measured accurately by means that will insure the same amount in each batch.
- (5) Masonry mortar shall be mixed in the proportion of one part of Portland cement to one part of lime putty to six parts of sand by volume.
- (6) Grout shall be mixed to the consistency of thick creem. Mortar grout shall be composed of 1 part of Portland cement to 1 part of sand, mixed with sufficient water to produce the required consistency.
- (7) All mortar shall meet the water retention and workability requirements of Federal Specifications SS-C-181a.

C. Work of Other Trades

- (1) The Contractor shall carefully examine the specifications for concrete, miscellaneous metals, structural steel, roofing and flashing, and any other Sections that affect work in this Section, so that proper coordination of masonry work with other work will be obtained.
- (2) The Contractor shall set plumb, square and in proper position and alignment all jamb and mullion anchors, flashing, sleeves, frames, combination metal bucks and trim, loose lintels, bearing plates, bolts, anchors, nailing strips, blocking and all other items built into masonry.

- (3) All openings in masonry shall be plumb, square and in proper position according to the Drawings.
- (4) Partitions shall not be cut for ducts, registers, sleeves and similar items without the approval of the Architect-Engineer.
- (5) Loints between masonry and frames shall be completely filled with mortar. Joints adjacent to window jambs shall be properly pointed for caulking.
- (6) The cutting of chases for mechanical and electrical work will not be permitted except with the express approval of the Architect-Engineer.

D. Scaffolding

(1) The Contractor shall furnish, maintain, move and re-erect all scaffolding that may be required for masonry work and this scaffolding shall be constructed and maintained in strict accordance with the requirements of the Building Code of the City of Denver. No overhand work will be permitted.

E. Laying Masonry

- (1) Partitions and door openings have been so arranged as to generally permit erection of walls and openings with a reasonable minimum of cutting.
- (2) All units shall be thoroughly wetted before being laid in the walls. Blocks shall be laid with cells vertical unless approved otherwise by the Architect-Engineer. All partition work shall be laid plumb, true to line and with courses level. Joints shall be uniform in width. Partitions shall extend full height to ceiling at concrete slabs except where otherwise shown on the Drawings.
- (3) All concrete masonry units shall be carefully bedded in mortar and set true and plumb in regular running bond, and with all joints uniformly 3/8 in. wide and completely filled.
- (4) Glazed facing tile shall be laid and handled with care. Units with chipped or spalled edges of noticeable size shall not be used. Tapping of glazed edges with a trowel shall be avoided. Patching and shellacking of defects will not be parmitted. All cutting of glazed units shall be done with a power driven carborundum saw.
- (5) Glaxing units shall be laid in 1/3 running bond, i.e. every third unit in height shall have vertical joints directly over each other instead of every second as in regular running bond. Soint width shall be determined by establishing the fixed height of 16 in. for three units plus three joints, or slightly over 1/4 in.

- (6) Bull nose units shall be provided at all external angle intersections of glased surfaces, including jambs and stools of windows.
- (7) Height of tile, unless otherwise shown on Drawings shall be to soffit line of beams at ceilings on Arena Floor and to spring line of arches (about $7^{*}-4^{*}$) on Main Floor.
- (8) Glazed scaps or splits shall be anchored to concrete masonry units with ties placed 12 in. o.c. horizontally and 16 in. o.c. vertically.

F. Chimneys

- (1) Chimneys shall be of sizes shown on Drawings, and shall be constructed of common brick laid up in mortar as specified for concrete masonry partitions.
- on the Drawings laid in fire clay morter with 1/8 in joints.
 - (3) Spaces or voids in the masonry will not be permitted, and all joints shall be completely filled.
 - (4) Fire brick shall have at least 15% headers bonding with common brick.
 - (5) Cleanout doors, furnished under Section No. 12, "Miscellaneous Metals," shall be installed under this Section at the bases of the chimneys.
 - (6) Base sections of flue lining with breeching connection shall be furnished under this Section, and turned over for installation under Section No. 3, "Concrete."

G. Joints and Pointing

- (1) Joints in concrete masomry units shall be neatly tooled flush, except that where such units are to be plastered, the joints shall be raked out to a depth of 3/8 in. to form a plaster key.
- (2) Joints in tile shall be raked out to a depth of 1/2 in. when tile is being laid and shall be pointed and tooled practically flush with a slightly concave surface. Pointing mortar shall consist of one part of cement, three parts of fine sand, and 10% of lime putty, with the addition of sufficient mortar color to give a joint of the color selected by the Architect-Engineer.

He Freezing Weather

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(1) No masonry shall be laid in temperatures below 32° F. unless adequate means approved by the Architect-Engineer are provided for maintaining a temperature above this point during and for 48 hours subsequent to laying. The requirements for wetting masonry units apply under these conditions also.

I. Cutting and Patching

(1) No masonry shall be cut and patched without the permission of the Architect-Engineer. All patching and replacing of masonry shall be done by the skilled workmen of the trade installing the work.

J. Cleaning

(1) Structural facing tile and concrete masonry shall be kept free from spatterings of mortar as the work progresses, and upon completion of the work all facing tile shall be washed down with soap powder and water. The whole job shall be left clean and free from excess mortar, dirt, stains, or other defacements. Any work which is damaged or cannot be cleaned to the satisfaction of the Architect-Engineer shall promptly be removed and replaced.

SECTION NO. 6 - ROOFING, SHEET METAL WORK AND DAMPPROOFING

The "General Conditions Governing All Contracts" and the "Specific Requirements" for Contract No. 1 shall apply to all work of this Section.

1. SCOPE

The work under this Section shall consist of furnishing all labor, materials and equipment necessary and required to complete all roofing, sheet metal work and dampproofing as shown on the Drawings, as herein specified, or as reasonably inferable from the Drawings and Specifications, generally as follows:

- A. Built-up smooth finish steep and flat pitch roofing for arch shell.
- Built-up slag finish roofing on flat roofs.
- C. Built-up base flashing at arch ribs and at junctures of flat roofs with walls.
- D. Membrane cap flashing at arch ribs.
- E. Metal joint caps over saturated felt on split arch ribs.
- F. Metal cap flashing over saturated felt at parapets, curbs, and elsewhere as shown on Drawings.
- G. Formed metal flashing at juncture of flat roof and corrugatedasbestos-cement siding.
- H. Metal dams for split-arch columns and grade beams at expansion joints.
- I. Sheet metal guides, flashing and felt insulation for slip joints between asbestos-cement siding and concrete columns.
- J. Metal reglets ribs on upper and lower flat roofs, east end, and at wall juncture on lower flat roof, east end.
- Spring steel closers for expansion joints in interior partitions.
- Metal expansion dams for ice floor. WORK NOT INCLUDED IN THIS SECTION

- A. Lightweight concrete roof fill and cants Section No. 3 "Concrete."
- B. Vent stacks, roof drains, flashing collars, and flashing for stacks and drains - Contract No. 3 "Plumbing and Fire Protection."

- C. Wood nailer strip inserts at arch ribs and on steep portions of shell roof Section No. 10 "Carpentry and Millwork."
- D. Entrance marquee complete, including panel, framing, frame and flashing Section No. 21 "Entrance Marquee."

3. MATERIALS

- A. Asphalt Roofing Materials
- (1) Asphalt for priming and roofing shall conform to the Standard Specifications of the ASTM, Serial Designation D312, Types (a) and (c), latest edition.
- asbestos

 (2) Asphalt saturated felt shall conform to the Standard Specifications of the ASSM, Serial Designation D226, latest edition, for 15 lb.

 type.
 - B. Coal-Tar Pitch Roofing Materials
 - (1) Coal-tar pitch for roofing on slopes not exceeding 1 in. per ft. shall conform to the Standard Specifications of the ASTM, Serial Designation D450, latest edition.
 - (2) Coal-tar pitch for slopes in excess of 1 in. per ft. shall conform to the Tentative Specifications of the ASTM, Serial Designation D654, latest edition.
 - asbestos
 (3) Coal-tar saturated/roofing felt shall conform to the Standard Specifications of the ASTM, Serial Designation D227, latest edition. (This is a 15 lb. type.)
 - C. Gravel or Slag

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(1) Roofing gravel shall consist of hard, tough, and durable particles free from adherent coatings. It shall contain no vegetable matter nor soft, friable, porous, or thin particles in quantities greater than 5% by weight. It shall be graded as follows:

Passing 3/4 in. screen 100%

Passing 5/8 in. screen 75%

Passing 3/8 in. screen 30%

Passing 1/4 in. screen 5%

(2) Slag shall be crushed, blast-furance dry slag, free of foreign substances and screened to conform to gravel size.

D. Metal Flashing

- (1) All metal flashing shall be USS 26 ga. (.018") monel, except at expansion joints where USS 25 ga. (.021") monel shall be used.
- (2) Solder shall be half-and-half pig lead and block tin conforming to ASTM B32. Flux shall be rosin.
 - (3) Lead wool for caulking shall be best commercial grade.

F. Miscellaneous

- (1) Elastic cement shall be a non-hardening waterproof cement with an asphalt base as manufactured by H. B. Fred Kuhls, Brooklyn, N.Y., or an approved equal.
 - (2) Dampproofing shall consist of waterproofing pitch applied hot
- (3) Fabric shall be 4 oz. Cotton Cord Cloth as manufactured by the Minwax Company, Inc., 11 West 42nd St., New York, N.Y., or an approved equal.

4. WORKMANSHIP

A. Preparation

- (1) The Contractor shall inspect all surfaces to receive built-up roofing and shall proceed with no work until the surfaces to be covered are completed and in proper condition.
- (2) The Contractor shall see that all decks, crickets, and cants are properly formed, roofs are uniformly graded to drains, and that all decks are smooth, firm, dry and thoroughly cleaned.
- (3) The Contractor shall see that all flashing collars, roof drains and reglets are properly installed and that vent lines are properly extended through the roofs.
- (4) Workmanship shall be first class in every respect and all roofing and sheet metal work erected under this Section shall be such that an absolutely watertight job will be provided.
- (5) The work of all other trades which will be concealed by this work shall be verified, inspected and approved before proceeding with the installation.

B. Asphalt Roofing on Lightweight Concrete Fill

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(1) Asphalt roofing on lightweight concrete fill shall have the following minimum requirements:

(c) Asphalt mopping coats, total...... 180 lb. per sq.

- (2) All asphalt used for greater slopes than 2 in, per ft. shall be steep pitch asphalt.
 - G. Coal-Tar Roofing on Lightweight Concrete Fill
- (1) Soal-tar reofing on lightweight concrete fill shall have the following minimum requirements:
 - (a) Coal-tar saturated felt..... 4 plies @ 15 lbs.
 - (b) Coal-ter pitch mopping coats, Total 200 lb. per sq.

 - (d) Slag...... 300 lb. per sq.
- (2) All coal-tar pitch used for alopes greater than 1 in. per ft. shall be steep pitch type.
- B. Asphalt or Coal-Ter Roofing on Shell Roof
- (1) Reofing shall consist of A plies of felt, and weight per square for morping coats shall be increased by 30 lb. over those shown in "B" and "C" preceding.
 - E. Application
- (1) Care shall be taken during application that all felt and paper is laid free from air pockets, wrinkles or buckles.
- (2) Asphalt or coal tar shall be preheated and kept at a temperature of not over 375° during the application period.
- (3) All roof surfaces shall be dry before application. Gravel or slag shall be kept dry and shall be heated before applying in cold weather.
 - F. Installation

- (1) Asphalt roofing on lightweight concrete fill:
- (a) Entire surface to be reofed shall be given one coat of asphalt primer and allowed to dry.
- (b) Over the primer a full coat of hot asphalt shall be applied. This shall be covered with four plies of 32 in. saturated felt, with each sheet lapped 24.5 in over the preceding ply. Each ply shall be mopped for the full width with hot asphalt weighing not less than 30 lbs. per square for each ply. In no case shall dry felt rest on dry felt.
- (c) Over the entire surface, a uniform coat of hot asphalt weighing not less than 60 lbs. per square shall be mopped.
- (d) While the asphalt is still hot, a surface finish of 400 lbs. of gravel or 300 lbs. of alag per square shall be embedded.

- (2) Coal-tar roofing on lightweight concrete fill:
- (a) A uniform coating of hot pitch shall be applied to the entire area to be roofed.
- (b) Over the entire area of the roof 4 plies of 32 in. saturated felt shall be laid at right angles to the slope of the roof, with each sheet lapped 24.5 in. over the preceding sheet. Each sheet shall be mopped for the full distance of the lap with hot pitch. The felt shall be firmly embedded in the hot pitch as applied. Care shall be taken to keep the exposed surface of the sheets clean and free from tar drippings.
- (c) Over the entire surface a uniform coat of hot pitch weighing not less than 50 lbs. per square shall be mopped.
- (d) While the pitch is still hot, a surface finish of 400 loss of gravel or 300 lbs. of slag per square shall be embedded.
 - (3) Asphalt or coal-tar pitch on shell roof:
- (a) Felts shall be run along vertical curves from springing to crown in unbroken sheets.
- (b) All roofing felts shall be nailed at the edges to the 1 in. x 3 in. wood nailing strips installed 4'-0" o.c. under Section No. 3 "Concrete."
- (c) Other details of installation shall be as Specified in (1) and (2) above.
 - G. Built-up Flashing

- (1) Roofing felts shall extend over cant strips and full depth of epen reglets to permit nailing of felts through metal disks to wood nailing strips in reglets.
 - (2) In metal reglets, built-up flashing shall be tightly wedged in.
- (3) Where metal cap flashing is used, the first two felts of the roofing shall extend up face of wall, curb or parapet for a distance of at least 4 in. above cant strip top and shall be embedded in full beds of hot pitch or asphalt.
- (4) Reglets shall be filled with lead wool plugs and caulked with elastic cement as indicated on Drawings.
- (5) Along reglets apply a heavy trowel coat of fibrous roofing cement and embed therein a strip of 4 oz. fabric protected with another heavy coat of cement.

H. Metal Flashing

- (1) All metal work shall be first class in every particular. Sheet metal work shall be assembled and secured with locked seams throughout, sweated with solder. Joints at corners and angles shall be mitred and the different sections accurately fitted and secured. All edges shall be properly pre-tinned before soldering.
- (2) All exposed edges shall be doubled back for strength and appearance. Where sheet metal occurs over a flat surface, it shall be fitted closely and neatly. Necessary cleats, stiffeners and reinforcement shall be provided to make all sections rigid and substantial. Proper allowance shall be made in all metal work for expansion and contraction. Details of joints shall be submitted to the Architect-Engineer for approval.
- (3) Where shown on Drawings, netal flashing shall be laid over saturated felt.
 - (4) The Contractor shall provide and install metal bellows for all expansion and construction joints in split arch ribs.

I. Dampproofing

Enclosing walls of all pits, tunnels, trenches and all other excavated areas below established grade shall be coated with at least two heavy moppings of approved waterproofing pitch over all outside surfaces. Should a satisfactory seal not be thus obtained a further coating shall be applied.

J. Contractor's Option

The Contractor, at his option, may substitute 20 oz. soft (roofing temper) copper for 26 ga. monel metal, and 20 oz. hard (cornice temper) copper for 25 ga. monel metal.

K. Intent

- (1) It is the intent of this Specification to give the widest possible latitude to the types of built-up roofing which may be used. The primary purpose is to secure the equivalent of a 20-year bonded roof.
- (2) The bonding of the roof is not mandatory; however, first consideration will be given to roofing manufacturers who are willing to furnish a bond.

L. Guarantee

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The Contractor shall guarantee all roofing and flashing for a period of 10 years against: leaking, failure to stay in place, splitting, pulling loose from under surface, and excessive alligatoring, buckling and tearing.

SECTION NO. 7 - ASBESTOS-CEMENT SIDING

The "General Conditions Governing All Contracts" and the "Specific Requirements" for Contract No. 1 shall apply to all work of this Section.

1. SCOPE

The work under this Section shall consist of furnishing all labor, materials and equipment necessary and required to complete all asbestos—cement siding as shown on the Drawings, as herein specified, or as reasonably inferable from the Drawings and Specifications, generally as follows:

- A. All siding for arena end walls together with fasteners, fittings and preformed asphalt closure strips, flashing and caulking to make siding weathertight.
- 2. WORK SET BUT NOT FURNISHED UNDER THIS SECTION
 - A. Flashing furnished under Section No. 6 "Roofing, Sheet Metal Work, and Dampproofing."
 - B. Rigid insulation spacing strips and adhesive furnished under Section No. 8 "Insulation."
- 3. WORK NOT INCLUDED IN THIS SECTION
 - A. Caulking.
 - B. Structural steel framing.
 - C. Asbestos-cement interior partitions.

A. MATERIALS

- A. General
 - (1) Panels and accessories shall be promptly replaced if damaged.
- (2) Panels shall be stacked on firm level supports spaced 12 in. o.c. extending full length of sheets in piles not over 18 in. high in enclosed storage and kept dry and clean.
 - B. Siding Panels
- (1) Siding panels shall be exterior type preformed asbestos-cement panels 42 in. x 132 in., 5/16 in. to 7/16 in. (3/8 in. avg.) in thickness, 1-1/2 in. wide over corrugations, with 4.2 in. pitch (c. to c. of corrugations) and weighing not less than 4 lbs. per sq. ft., and shall be corrugated transite as manufactured by Johns-Manville Corporation, or an approved equal.

(2) Fasteners for erection shall be standard with the panel manufacturer.

5. WORKMANSHIP

A. Brection

- (1) All corrugated asbestos—cement panel siding shall be erected with smooth side to weather in strict accordance with the manufacturer's detail drawings and specifications.
- (2) Holes shall be drilled 9/32 in. dia. for head-head bolts through lapped ridges of cerrugations.
- (3) End laps shall be not less than 6 in. All openings caused by corrugations along tops and bottoms of sheets shall be closed with continuous molded preformed asphalt composition closure stripping.
- (4) Outting in field shall be done with power carborundum wheel or says
- (5) Care shall be exercised to set vertical and horisontal lines of panels plumb and straight.

B. CLEANING AND SPOTTING

- (1) Siding shall be thoroughly cleaned after erection.
- (2) All exposed fastenings shall be cleaned and immediately spotted with a coat of approved paint to match the siding as nearly as practicable.

SECTION NO. 8 - INSULATION

The "General Conditions Governing All Contracts" and the "Specific Requirements" for Contract No. 1 shall apply to all work of this Section.

1. SCOPE

The work under this Section shall consist of furnishing all labor, materials and equipment necessary and required to complete all insulation as shown on the Drawings, as herein specified, or as reasonably inferable from the Drawings and Specifications, generally as follows:

- A. Corkboard lining on arena ceiling.
- B. Glass fiber board lining on arena end walls.
- 2. WORK FURNISHED BUT NOT SET
- A. Rigid insulating strips and adhesive for use between metal frame and end wall siding shall be furnished under this Section and installed under Section No. 7 "Asbestos Cement Siding."
- 3. WORK NOT INCLUDED IN THIS SECTION
 - A. Lightweight concrete fill on flat concrete roof slabs.
- 4. MATERIALS
 - A. General

Handling, packaging, shipment and storage of all materials shall be accomplished in accordance with manufacturer's directions. Any damaged materials shall be promptly replaced.

- B. Corkboard
- (1) Corkboard for insulation of arena ceiling shall be 18 in. x 36 in. x 1-1/2 in. preformed compressed square edge boards of pure cellular cork.
- (2) The corkboard shall weigh not more than 0.65 lbs. per board foot and its thermal coefficient shall be not less than 0.27 at 60° F.
- (3) Board shall be standard type without finish but shall be strong, tough and readily shaped to fit around curved surfaces and shall not settle, sag, shrink, swell or warp.
 - (4) Nails for corkboard anchorage shall be 3 in. long.

C. Glass Fiber Board

- (1) Glass fiber board insulation for lining end walls of arena shall be preformed 24 in. x 60 in. x 1 in. and 24 in. x 48 in. x 1 in. rigid boards made up of glass fibers and plastic binder compressed to a density of 10-1/2 lbs. per cu. ft. and shall be Fiberglas as manufactured by Owens-Corning Fiberglas Corporation or an approved equal.
 - (2) Boards shall have smooth sanded finish on one side.
 - (3) Sanded surfaces shall be given one shop coat of shellac or lacquer.
- (4) Fiberglas boards shall be applied to the siding with metal clips as detailed on Drawings.

D. Spacing Strips

- (1) Specing strips for end wall insulation shall be used between metal frame and asbestos cement siding.
- (2) Strips shall be cut from rigid structural compressed wood fiber or other approved boards about 24 in. x 48 in. x 1 in. conforming to ASTM C-208, Class C.
- (3) Stripe shall be installed under Section No. 7 Masbestos Cement Siding. "

E. Adhesive

Adhesive for strips and boards shall be Miracle Adhesive Corporation's Type MT or an approved equal.

F. Shop Drawings

Shop drawings and detailed layouts of all insulation showing methods of installation shall be submitted in triplicate to the Architect-Engineer for approval.

5. WORKMANSHIP

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A. General

Installation of insulation shall be done in strict accordance with manufacturer's detail drawings and specifications.

B. Corkboard

- (1) Corkboard insulation units shall be laid on forms in place for arched roof shell, long sides horizontally,
- (2) Anchorage shall consist of nails driven diagonally at approximately 45 degrees, using four nails per board. The nails are intended to provide mechanical anchorage in the concrete.
 - (3) No broken or fractured boards shall be laid.

(4) Units shall be laid continuously with joints broken as in unbonded brickwork except at expansion joints which shall be left clear, straight, and uniformly 1 in. wide.

C. Glass Fiber Board

- (1) Wall units shall be in direct contact with inside rough faces of corrugated asbestos-cement panel siding.
- (2) Rigid insulation spacing strips shall be correctly spaced and leveled to receive Fiberglas panels.
- (3) The Contractor shall apply adhesive continuously along all ridges of corrugations and then set the bottom edge of each board in the groove shown on the Drawings, then bend and spring the board into place, with the top edge in its groove as shown on the Drawings. This procedure shall be continued until all inner surfaces of corrugated siding are covered with insulation.

6. CONTRACTOR'S OPTION

The Contractor at his option may substitute the following for corkboards for insulating the arena ceiling:

A. Material

Board shall be compressed wood fiber 24 in. x 48 in. x 2 in. impregnated and coated with cement conforming to FS-SS-A-118a for fire resistance weighing 4 lb. per sq. ft., and shall be Sono-Therm Structural Insulating Board, manufactured by the Sono-Therm Company, Inc., Addison and Third Streets, Berkeley, California, or an approved equal.

B. Application

- (1) Boards shall be laid on top of forms in running bond. The greatest care shall be exercised to make certain that no substance on the form or surface of insulation laid against the form will damage the insulation when forms are removed.
- (2) Nail anchorages shall be used as specified for corkboard except that there shall be six per board.

SECTION NO. 9 - METAL WINDOWS

The "General Conditions Governing All Contracts" and the "Specific Requirements" for Contract No. 1 shall apply to all work of this Section.

1. SCOPE

The work under this Section shall consist of furnishing all labor, materials and equipment necessary and required to complete all metal windows as shown on the Drawings, as herein specified, or as reasonably inferable from the Drawings and Specifications, generally as follows:

- A. Standard modular size commercial projected steel sash and frames with standard steel T-bar mullions.
 - B. Finish hardware.
- 2. WORK NOT INCLUDED IN THIS SECTION
 - A. Glass and glazing.
 - B. Field painting.
 - C. Special wood fixed sash at main entrance are specified elsewhere.
 - D. Caulking.

3. MATERIALS

- A. General
- (1) Any material or work damaged upon arrival at the building shall be promptly replaced unless immediately upon its arrival the Architect-Engineer is advised, inspects and agrees in writing to accept provisionally such damaged articles.
 - (2) Finishing hardware shall at all times be adequately protected.
- (3) Metals used for the work of this Section shall be free from defects impairing strength or appearance and of the best commercial grades for their function and situation in the structure.

B. Steel Sash

- (1) All steel windows shall be commercial projected as manufactured by the Truscon Steel Company, Youngstown, Ohio, Mesker Brothers, St. Louis, Missouri, or an approved equal. All windows shall be of modular dimensions as shown on the Drawings.
- (2) All sections and mullions shall be not rolled new billet steel. Vertical mullions shall be standard T bars or other approved sections sized as shown on the Drawings and so designed to compensate for variations in the masonry openings.
- (3) Brackets, supports, accessories and all connections shall be of an approved type and weight and shall be adequate to withstand safely all stresses and strains to which normally subjected. Bolts and nuts shall be hot galvanized or Cadmium plated steel.

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A. Fabrication

- (1) All frames and sash sections of steel windows shall be neatly fitted with weather joints.
- (2) Muntin intersections shall be rigidly interlocked to prevent racking or distortion due to handling and erection and to give maximum strength against wind pressure. Window shall be designed for inside glazing.
- (3) All ventilator sections shall move freely without binding or twisting when the windows have been completely installed. The joints between the ventilator sections and the fixed portions shall be made weathertight by means of double flat contact weathering provided on all four sides of the ventilator.
- (4) Mullions shall be neatly out to length as shown on the Drawings. They shall securely join the units together and shall be adequate to withstand a wind load of 20 lbs. per sq. ft., withstand stress and strain to which normally subjected, and shall project a minimum of 2 in. into the sill for anchorage.

B. Erection

- (1) Work under this Section shall be installed and erected plumb, straight, square, level, and at its proper elevation, plane and location in proper alignment with other work. All work shall be erected in a substantial manner and made rigid.
- (2) Metal to metal contacts shall be made watertight by buttering the contact surfaces of sash members and mullions with caulking compound of approved manufacture immediately prior to erection. Frames and sash when erected shall show even exposed widths of margin at heads, jambs, mullions and sills.

- (3) All bolts, washers, anchors, clamps and fastenings necessary to secure the frames, such and mullions shall be furnished and installed in accordance with the Drawings and the manufacturer's standards.
- (4) Proper provision shall be made for caulking between the metal window work and the construction work.
- (5) Moving parts of windows shall be installed complete with hardware, fittings, fixtures and accessories. Moving parts shall be made to operate uniformly, smoothly and with a minimum of manual exertion.
- (6) Prior to the painting of windows and the installing of the interior concrete sills, the Contractor shall check the window frames and sash to insure their being in perfect alignment. Any adjustment necessary to bring sash and mullions to perfect line and level shall be made.
- (7) Window operators shall be checked and correctly adjusted to insure the proper operation and clearance of each ventilator.

C. Attachment of Hardware

- (1) Manual ventilators shall be equipped with cam handle and pole ring.
- (2) Hardware shall be solid bronze U.S. 20 finish.
- (3) Twelve bronze pole hooks complete with wood poles and bronze hangers shall be provided.
- (4) Hardware shall be removed and attached after field painting and glazing.

D. Shop Painting

- (1) Steel windows and mullions shall be bonderized followed by a dipped and oven baked coat of rust inhibitive paint.
- (2) The cleaning, processing and painting shall be executed with the minimum time interval between operations conducive to good work.

SECTION NO. 10 - CARPENTRY, MILLWORK, ETC.

The "General Conditions Governing All Contracts" and the "Specific Requirements" for Contract No. 1 shall apply to all work of this Section.

1. SCOPE

The work under this Section shall consist of furnishing all labor, materials and equipment necessary and required to complete all carpentry, millwork, etc., as shown on the Drawings, as herein specified, or as reasonably inferable from the Drawings and Specifications, generally as follows:

- Exterior and interior wood doors.
- C. Aluminum bar windows, and wood bar windows alternate.
- Corrugated asbestos-cement interior partitions.
- Ticket booths.
- Seats and benches.
- G. Shelving.
- H. Catwalk plank flooring, runners, and bolsters.
- I. Nailing strips, grounds and blocking.
- Rough hardware including nails, screws, spikes, bolts, expansion bolts, hangers, etc.
- Protection and temporary enclosures, scaffolding, etc.
- Shop painting.
- WORK NOT INCLUDED IN THIS SECTION
 - A. Forms for concrete work.
 - Scaffolding for other Contracts.
 - C. Door frames and installation.
 - D. Metal doors and hardware installation.
 - Asbestos cement siding.
 - Finish hardware.
 - Glass and glazing. G.
 - H. Finish painting.

3. MATERIALS

A. Shop drawings of all millwork shall be prepared and submitted in triplicate for the approval of the Architect-Engineer.

B. Lumber

- (1) All lumber shall comply with the American Lumber Simplified Practice Recommendation R16, unless otherwise noted or approved. Lumber shall bear the official grade mark of the association under whose rules it is graded and moisture content shall conform to the requirements of said rules.
- (2) All lumber and millwork in transit or wherever stored shall be protected against damage or change of moisture content from the label specification.
- (3) Except as otherwise specified, limber of wood blocking, grounds, furring, nailing strips, etc., shall be Southern yellow pine or Western pine for No. 2 dimension, No. 2 beards or strips, as required and indicated.
 - (4) Blocking and other material that will be affected by action of the weather shall be No. 1 select cypress, unless otherwise approved.
 - (5) Bolsters shall be birch, red oak, or other approved hardwood.
 - (6) Wood in contact with or installed in concrete or masonry shall be treated with an approved type of wood preservative.
 - (7) In general, wood shall be S4S.
 - Co. White lead shall conform to ASTM D81, latest edition, for "Basic Carbonate White Lead."

4. EXTERIOR WOOD DOORS

- A. Doors called for on Drawings shall be solid batten core 5 ply 1-3/4 in. thick flush veneer doors as manufactured by the Roddis Door Manufacturing Company, Marshfield, Wisconsin, or an approved equal.
- B. Cores shall be of softwood strip-blocks of narrow widths assembled with the grain running parallel and vertically. Cores shall be railed on all four edges with 3/4 in. thick hardwood strips with double thickness strips top and bottom. Strips on side edges shall be same wood as face veneer. The whole assembly shall be glued under pressure with water resistant glue and thoroughly kiln dried, seasoned and planed smooth.
- C. Crossbanding of 1/10 in. thick, thoroughly kiln dried, hardwood veneer shall be laid at right angles to the core and glued with waterproof phenolic resin glue under pressure and heat to both sides of the core. Crossbandings shall run full to the four edges of the door.

- D. Face veneers of 1/28 in. rotary cut birch laid with grain at right anlges to crossbandings shall be waterproof-glued under pressure and heat to both sides of door, and belt sanded smooth.
- E. All exterior wood doors shall be provided with 26 ga. monel metal channels 1-3/4 in. x 1/2 in. full width of doors along top and bottom. Flanges shall be recessed flush with door surfaces and fastened with countersunk flat head white metal rust resisting screws spaced 6 in. o.c. Glazing rebates at bottoms of vision panels in doors shall be adequately flashed with 26 USS ga. monel metal under glazing beads.
- F. Glass and glazing shall be provided under another Section. Glass stops set in white lead shall be installed under this Section.
- G. Double doors shall be provided with an astragal molded from same
- H. Doors shall be factory finished. Hardware furnished under Section 19 shall be fitted and installed under this Section.

5. INTERIOR WOOD DOORS

- A. Interior hollow core slab doors shall be of the type, size and thickness shown on the door schedule. Face veneer shall be clear birch. Doors with softwoodstiles shall have hardwood strips on vertical edges to match face veneer applied at the time the cores are laid up.
- B. Core stiles and rails shall be of clear white pine or of hardwood. Top rails shall have a minimum width of 3-1/2 in. or shall have additional reinforcement to provide this width at point of attachment of door closer, whether or not door closers are specified. Material and design of core shall be subject to the approval of the Architect-Engineer. Core members shall be closely spaced. Three ply veneer facing shall be applied to core under pressure and glued with water resisting glue. All hollow core doors shall be "Rezo" as manufactured by the Paine Lumber Company, "New Londoner" as manufactured by the American Plywood Corporation, 700 series as manufactured by the Mengel Company, or General as manufactured by General Plywood Corp.
- C. Before fabricating doors, manufacturer shall obtain hardware schedule and shall provide all lockblocks and any additional reinforcing blocks necessary for any hardware attached to door. All hardware shall be fitted and installed for these doors under this Section.
- D. Where louvres are called for on the door schedule they shall be furnished as part of this Section and set into the bottoms of door. Louvres shall be similar to "Airolite" #560 and shall be furnished with prime coat.

6. DOOR HANGING

- A. All doors shall be set plumb and square in the metal frames and shall be accurately fitted to clearances shown.
- B. Boors shall be trimmed and fitted so as to leave equal stiles on each side and equal headrail and to fit snugly without binding.
- C. Hardware for doors shall be fitted so they will close without forcing and to prevent any rattle. Hardware cuts shall be true and neat.
- D. Immediately after fitting, interior doors shall be removed for painting top and bottom edges with one heavy coat of white lead and oil. The painting shall be done under Section 20 "Painting."

7. BAR WINDOWS

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- A. Aluminum bar windows at Exhibit area on either side of Main Entrance and at Restaurant shall be fixed extruded aluminum bar type windows similar to those manufactured by the E. K. Geyser Company, 915 McArdle Roadway, Pittsburgh 3, Pa. All members shall be shipped knocked down or in bar form to detailed lengths for assembly at the site. Horizontal bars shall be greatest length possible to obtain rigid end connections. No splices will be permitted except over bearings.
 - B. Bar Windows Deductible Alternate No. 3.
- (1) Wood bar windows at Exhibit Areas on either side of Main Entrance and at Restaurant shall be fixed frames and sash. All woodwork shall be clear white pine. Joinery shall be accurate, neat, straight, square, plumb and true. All openings shall be equal in dimension and workmanship. Detail drawings shall be followed accurately. Longest practicable horizontal bar shall be used and joined as approved on shop drawings by the Architect-Engineer. Mullion sections shall be full length. Sash sections shall be weathertight. Aluminum glasing strips shall be provided, secured to frames and set in white lead, and sash shall be glazed under Section 18 "Glass and Glazing." Frame sections shall be expertly scribed.
- (2) Entire perimeter of frames shall be caulked, and frames shall be back painted with asphaltum paint before setting. All woodwork shall be prime painted: all concealed surfaces before assembly, and entire units after assembly.

8. CORRUGATED ASBESTOS CEMENT PARTITIONS

- A. Partitions enclosing Main Lobby and Ticket Booths shall be constructed of corrugated asbestos-cement of types similar to that specified under Section No. 7 "Asbestos-Cement Siding."
- B. Ceiling and corner channels, ticket booth frames and floor angles shall be furnished and installed under Section: MD:-12 "Miscellaneous Metals."

C. All panels shall be erected plumb and true with smooth faces towards lobby. The space between the corrugated asbestos cement and floor angles shall be filled with concrete troweled to smooth finish. Ticket booth fronts shall be formed of 1/4 in. flat sheet asbestos—cement.

9. COUNTERS

Counters shall be furnished and installed at northwest and southwest entrance ticket booths. Counters shall be 5 ply fir plywood supported on brackets of same material and covered with 1/8 in. tempered Presdwood, as manufactured by the Masonite Corporation. Presdwood shall be attached to countertop with waterproof glue, neatly scribed on all exposed edges to extruded aluminum binding strip.

10. CASH DRAWERS

Cash drawer of formed plywood or sheet metal shall be installed complete with slide supports at each ticket window in all ticket booths. Suitable subdivisions for segregation of silver and bills of different denominations shall be provided.

11. SEATS AND BENCHES

Seats and benches shall consist of three slats of clear red oak 1-3/4 in. x 3-3/4 in. substantially splined. Edges shall be rounded and tops of splined joints shall have shallow V grooves exposed. Seats shall be fastened by galvanized screws to cast iron brackets and angles furnished under Section No. 12 "Miscellaneous Metals." Screws shall be applied from under side. Seats shall be prime coated with shellac.

12. SHELVING

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Shelving in storage rooms where shown on the Drawings shall be standard metal type conforming to FS-AA-S-271 and shall be equal to Penn Metal Corp. of Pennsylvania, 48 Oregon Avenue, Philadelphia, Pa., Penco Type 20 steel shelving. Assembly shall consist of shelves, posts and braces, 12 in. deep, 7 shelves 14 in. o.c. high, including top shelf and bottom shelf 6 in. off floor and similar to Penco Open Type Plain Shelving Style No. 117, Type B.

13. NAILING STRIPS AND GROUNDS

- A. Nailing strips, furring grounds and blocking shall be provided for securing in place woodwork, metal lath, plaster beads and base and wherever required by other trades in supporting their work. All nailing strips, etc., shall be thoroughly impregnated with Cabot's "Conservo" or other approved toxic wood preservatives.
- B. Nailing strips and grounds mad against concrete or other masonry shall be securely fastened to same in a manner approved by the Architect-Engineer. Wailing strips or blocking installed in concrete shall be formed with beveled edges and ends so as to key into the concrete when set.

14. CATWALKS

A. Floor

- (1) Flooring shall be 2×6 T and G lumber securely nailed to ledgers and snugly set.
 - (2) Ledgers shall be 4 x 4's bolted to steel catwalk stringers.

B. Bolsters

Bolster shall be fitted between steel hanger caps and shell roof, and shall be 4 in. wide, 10 in. long, and 1-1/2 in. or 2 in. thick, actual dimensions, depending on type of insulation used.

15. WOOD PRESERVATIVE AND PAINTING

Without exception, millwork schedule to receive painted finish shall receive one prime coat of white lead and oil of approved brand and quality.

All stock for millwork before or after fabrication shall be treated in accordance with the minimum requirements established under the rules and regulations of the National Door Manufacturers Association for the preservative treatment of millwork. Treatment shall prevent swelling and rotting and shall be resistant to fungi, termites and blue stain.

The wood thus treated shall bear the NDMA seal of approval. A certificate of compliance from the wood preserver certifying to the above treatment will be accepted in lieu of the seal.

SECTION NO. 11 - METAL DOORS AND FRAMES

The "General Conditions Governing All Contracts" and the "Specific Requirements for Contract No. 1 shall apply to all work of this Section.

1. SCOPE

The work under this Section shall consist of furnishing all labor, materials and equipment necessary and required to complete all fabrication and installation of metal doors and frames as shown on the Drawings, as herein specified, or as reasonably inferable from the Drawings and Specifications, generally as follows:

- A. All hollow metal doors, vision panels and louvres.
- B. "B" labeled doors.
- C. Rolling steel doors, power operated, and hand-crank operated.
- D. All combination frames and trim except for main entrance doors.
- E. Ticket booth window frames and louvres.
- F. Installation of all hardware for above items.
- G. Shop painting.
- 2. WORK NOT INCLUDED IN THIS SECTION
 - A. Vault door.
 - B. Structural steel door frames.
 - C. Main entrance door frame.
 - D. Wood doors.
 - E. Furnishing finish hardware.
 - F. Finish painting.
 - G. Glass and glazing.
 - H. Electric service and wiring for power operated doors are included under Contract No. 4, Electrical Power and Lighting.

3. MATERIALS

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A. General

- (1) Materials used in the construction of the doors and frames in this Section shall be of approved manufacture and free from defects impairing strength, durability and appearance.
- (2) Shop drawings shall be prepared showing quantities, sizes of sections, dimensions, methods of construction and assembly, and position of hardware; and shall be submitted in triplicate for the approval of the Architect-Engineer.
 - B. Hollow Metal Doors, Frames and Louvres
- (1) Sheet steel shall be No. 18 USS ga. A-1 furniture stock cold rolled, fully pickled, annealed, patent or stretcher leveled, oiled and free from scale and pits.
- (2) Moldings for louvre and vision panels shall be not less than No. 20 USS ga. cold drawn steel.
- (3) Louvres where called for on Door Schedule shall be formed from No. 14 USS ga. steel similar and equal to Airolite Company's Stationary Type No. 560. Ticket booth louvre shall be equal to Airolite Company's No. 696.
- (4) Astragals shall be not less than No. 18 USS ga. steel on meeting stiles of double doors.
- (5) Door reinforcements shall be not less than No. 16 USS ga. generally and for steel box for locks; 5/32 in. reinforcement for hinges; and No. 14 USS ga. reinforcement for lintel support, door closers and strikes.
- (6) Sound deadening material shall be of approved material standard with door manufacturer.
- (7) Combination frames shall be of best commercial grade No. 14 USS ga. cold drawn, patent leveled, open hearth, steel sheets free from defects impairing strength, durability and appearance and conforming to ASTM A93.
- (8) Samples of corner sections of door, combination frame and astragal shall be assembled by Contractor and submitted to Architect-Engineer for approval prior to fabrication.
 - C. Rolling Steel Doors Power Operated and Hand-Crank Operated
- (1) Doors shall be commercial rolling steel doors as manufactured by the J. G. Wilson Corporation, Norfolk, Virginia) or approved equal.

 "Kinnear Manufacturing Company - - -)
- (2) The curtain shall be formed of 20 ga. copper bearing galvanized steel interlocking corrugated slats. Corrugations shall be 7/8 in. deep with galvanized malleable iron end locks riveted to alternate slats. Top and bottom slats shall be adequately reinforced.

- (3) Hood shall be 24 ga. copper bearing galvanized steel providing complete enclosure of the curtain coil and adequately braced at intervals as required by the span of the door.
- (4) Guides shall be of proper sizes made from structural steel units providing an uninterrupted groove for the curtain.
- (5) The rotating drum shall run on roller bearings of the best selflubricating type. Springs shall be best quality oil tempered with 25% overload allowance, grease packed, accurately balancing the curtain.
- (6) Doors Nos. 119 and 122 shall be power operated. Gears shall be best machine quality gray iron cast from machine cut patterns. Operators shall be made with all machine cut mechanism and shall be complete with all oil filled reduction units, central switches, automatic limit switches, etc.

 Emergency manual operators automatically interlocked with power control shall be provided. Locking device shall be provided for push button controls.
- (7) Doors No.s 121, 123 and 177 shall be hand-crank operated and shall be Class B label or oversize label as required, equipped with fusible links each side of door.

4. WORKMANSHIP

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A. Fabrication

- (1) Hollow metal doors shall be 1-3/4 in. thick of solid flush design both sides with or without panel for glazing or louvre as required on the Door Schedule. Doors shall consist of two plates rigidly connected by continuous interlocking members spaced at least 6 in. on centers. Sound deadening material shall be effectively applied to inside of plates under adhesion and pressure, except as otherwise required for labeled doors. All joints shall be welded through their entire length and welds ground smooth and invisible. Moldings shall be of stock die drawn steel with well formed mitres in true alignment, one side removable with oval head screws to permit glazing with 7/32 in.glass.
- (2) Labeled doors as called for on Door Schedule shall be solid flush type hollow metal meeting the requirements and tests of the MBFU and Underwriters' Laboratories, and shall bear Class "B" labels for both door and frame for each such opening.
- (3) Combination frames shall consist of stock die section as selected or detailed on the Drawings, rebated with integral stop, corners mitred, welded and ground smooth. Frames shall be secured by clip angles expansion bolted to floor in back of jambs, and shall be kept in alignment until set by 2 in. channel spreaders. Each jamb shall be provided with at least three 2-1/2 in. No. 14 ga. adjustable tee anchors, with extended leg perforated for bonding. Heads of all bucks shall be provided with suitable stiffening for the full width of frame for openings wider than 3'-4". Doors shall be provided with not more than 3/32 in. clearance at jambs and heads and shall have proper bevels on lock stiles to operate without binding. Frames for ticket booth windows and louvre shall be as shown on the Drawings

B. Hardware

- (1) Hardware for doors and frames shall be furnished under Section 19 "Finish Hardware," but shall be installed under this Section.
- (2) Templates for finish hardware or hardware shall be shipped to door and frame manufacturers in sufficient time not to interfere with crating and shipping.

C. Shop Painting

- (1) All surfaces of steel members shall be thoroughly cleaned and coated with an approved rust inhibiting paint prior to assembly.
 - (2) After assembly all units shall be thoroughly cleaned and bonderized.
- (3) All uneven surfaces shall be given sufficient coats of mineral.
 filler to provide smooth surfaces, each coat baked and sanded to a true even surface.
 - (4) A priming coat of paint shall then be applied and baked on.

D. Erection

- (1) The doors and frames herein specified shall be erected by the manufacturer or his authorized representative and shall be installed and erected plumb, straight and true at the proper elevation. The Contractor shall do all cutting and fitting required for the complete installation of the job.
- (2) At completion, the Contractor shall finally check and adjust the entire installation and have same in perfect operating condition.

SECTION NO. 12 - MISCELLANEOUS METALS

The "General Conditions Governing All Contracts" and the "Specific Requirements for Contract No. 1 shall apply to all work of this Section.

1. SCOPE

The work under this Section shall include the furnishing of all miscellaneous metals as herein specified, or as reasonably inferable from the Drawings and Specifications, and all labor, materials and equipment required for the installation of such metals, except as specifically excluded from this Section. The following is a general listing but shall not be deemed as all inclusive:

- Handrails and brackets.
 - B. Guard rails.
 - O. Door saddles.
 - D. Door angle and wheel guards.
 - E. Channel and angle frames for interior corrugated partitions.
 - F. Ladders.
 - G. Scuttles.
 - H. Arena floor sockets.
 - I. Bench and seat brackets.
 - J. Access doors.
 - K. End wall arch angle.
 - L. Miscellaneous bolts and anchors, etc.
 - M. Shop painting.
 - N. Structural steel door frames.
 - 0. Vault door.

- P. Entrance door and transom frames and sub-frames.
- Q. Guard chains.

- R. Cooling coil slesves in concrete plenum wall for ice floor.
- S. Cleanout doors and frames.
- T. Inserts.

2. WORK NOT INCLUDED IN THIS SECTION

- A. Structural steel framing including steel ships-ladders and stairs.
- B. Steel windows.
- C. Metal doors.
- D. Sheet metal work.

E Field painting

3. MATERIALS

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All materials shall conform to the latest editions of ASTM and Federal Specifications.

- A. Structural steel shall conform to ASTM and FS-QQ-S-72la and shall be clean and free from will scale, loose rust and pitting.
- B. Cast iron shall conform to ASTM A48 and FS-QQ-I-652 and shall be best quality gray iron suitable for the finest work.
 - C. Wrought iron shall conform to ASIM A41 and FS-QQ-I-686a.
 - D. Steel pipe shall be standard black.
 - E. Steel sheets, black, shall conform to ASTM A245 and FS-QQ-I-696.
- F. Galvanizing shall conform to ASTM A123 and Class C hot dipped as specified for Zinc Coated Sheets, F.S.
 - G. Red lead 97% shall conform to ASTM D83 and FS-TI-R-191a.
- H. Aluminum shapes shall be ALCOA or equal standard angles and standard die extruded shapes as shown and indicated on Drawings.
 - I. Linseed oil shall conform to ASTM D234 and PS-JJJ-0-336.
 - J. Turpentine shall conform to ASTM D13 and FS-LLL-T-7916.

4. WORKMANSHIP

- A. All units of miscellaneous metals shall be fabricated and assembled in a thorough, modern manner by mechanics skilled in their trade.
- B. Welding shall be continuous, fillet or butt as required, except when otherwise approved by the Architect-Engineer. Exposed welds shall be ground smooth. Drilling and cutting shall be neatly and accurately done, using templets where necessary. All exposed joints shall be close fitting, and shanks of bolts and screws, etc., shall be cut off flush and finished smooth.
- C. Shop drawings for all work in this Section shall be submitted for approval, which shall be secured before starting fabrication.
- D. Samples of items and finishes shall be submitted for approval before fabrication

5. FABRICATION

A. Handrails and Guard Rails

- (1) All hand rails and guard rails shall be $1\frac{1}{2}$ in. I.D. standard black steel pipe.
- (2) Wall rails shall be supported on standard malleable iron brackets with flanges secured to walls by expansion bolts. Rails shall be secured to brackets by tap screws. Wall rails shall terminate in bends and malleable iron wall fittings expansion bolted to walls.
- (3) All single and double rails shall be flush welded to stanchions and stanchions shall be welded to bese plates. Base plates shall be expansion bolted to concrete by not less than three bolts per plate.
- (4) Railings terminating against walls shall be secured by flush welded flange expansion bolted to walls.

B. Catwalk Railing

- (1) Catwalk railing shall be comprised of 1-1/2 in. x 1-1/2 in. x 1/4 in. angle rails and standards flush velded at intersections of rails and standards.
 - (2) Standards shall be welded to edge channels of catwalk.

C. Door Saddles

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- (1) Door saddles where shown on Drawings shall be approved fluted or corrugated abrasive top surfaced extruded or cast brass saddles 1/2 in. high coped to fit combination steel frames, except where bent standard checkered steel plate saddles are shown.
- (2) Saddles shall be fastened with 3 in. x 1/4 in. countersunkflat head expansion bolt anchors into consrete floors spaced 12 in. o.c.

- (3) Saddles between tile flooring and cement finished flooring shall be square edge on tile side and beveled on other side to take up difference in levels.
- (4) At Main Entrance at edge of terrazzo provide a continuous 2 in. x 2 in. x 1/4 in. alwaimum angle with expansion bolts.

D. Door Angle and Wheel Guards

- (1) Boor angle and wheel gnards shall be as detailed on Drawings. Guards at roll-up doors unless otherwise indicated shall consist of 4 in. x 4 in. x 1/4 in. structural steel angles at least 7:-6" high at each of two interior corners of opening; and each angle shall have welded to inside flanges 1/4 in. x 2 in. galvanized steel V annhers spaced 24 in. o.c. for building into concrete work. Guards shall be set plumb and true.
- Foundry Company's No. 27232 22 in. x 22 in. x 48 in. high cast iron guards or equal with galvanized anchors for building into concrete work.

E. Frames for Entrance Lobby Partitions

- (1) Frames for Entrance Lobby corrugated partitions shall consist of 2 in. continuous channels at top and continuous 2 in. $x ext{ 3 in. } x ext{ 3/16 in.}$ angles at base. Top channels shall be secured to framing of suspended ceiling. A continuous 1 in. $x ext{ 1/2 in. } x ext{ 1/8 in.}$ closure angle shall be provided at base secured by countersunk tap screws to base angle.
- (2) Two vertical 2 in. channels shall form intersection of corrugated panels and shall be rigidly secured to ceiling channel and floor angle.
- (3) Main Entrance ticket booth fronts shall be framed with steel angles, molding and glazing channels as shown on the Drawings.

F. Ladders

Ladders leading to roof scuttles in Mechanical Equipment Rooms on merianine shall be formed of 2 in. x 1/2 in. W.I. strings 18 in. apart. Rungs shall be 3/4 in. round rods 14 in. o.c. pierced through and welded to strings. Bottoms and tops of stringers shall be provided with flanged ends or angles and expansion belted securely to concrete and masonry. Brackets on stringers spaced not over 60 in. o.c. shall be 2 in. x 3/8 in. W.I. bars bent to shape and expansion belted to concrete and masonry to support ladders 8 in. out from walls.

G. Scuttles

Scuttles where shown shall be 30 in. x 36 in. clear opening galvanized copper bearing steel frame and cover equal to Type I as manufactured by the Bilco Company, New Haven, Conn. Curb as well as door shall have 1/2 in. thick fibre insulation.

H. Arena Floor Sockets

- (1) Floor sockets for removable barriers and for control rails in Entrance Lobby shall be furnished and set in locations shown on the Drawings.
- (2) Sockets shall be fabricated galv. wrought iron sleeves providing snug fit for removable 2 in. dia. extra strong pipe stanchions.
- (3) Each socket shall be 5-1/4 in. deep with 4 in. x 4 in. x 1/4 in. galv. wrought iron flange at base.
- (4) The top of the socket shall have a galv. wrought iron floor flange which shall be flush with finished floor surface. A threaded screw cap of approximately 3/4 in. depth shall fit flush with floor surface when closed.
- (5) Removable pipes and barriers shall be provided under Section No. 22, "Removable Barriers."

I. Bench and Seat Brackets

In team rooms, benches shall have wood seats furnished and installed under Section No. 10, "Carpentry, Millwork, Etc." Brackets for benches which shall be furnished hereunder shall be equal to Contractors Foundry, Philadelphia, Pa., Pattern No. 852 cast iron 10 in. x 1 ft. 4-5/8 in. galvanized and expansion bolted or otherwise securely anchored to concrete or to partitions. Wood seats in shower rooms at glazed hollow tile partitions shall also be furnished under Section No. 10, "Carpentry, Millwork, Etc." Brackets for seats shall be furnished by this Contractor and shall be 3 in. x 3 in. x 1/4 in. galv. iron angles at both ends of each seat equipped with expansion bolts for securing into adjacent glazed hollow tile.

J. Access Doors

Where indicated on Drawings, access doors shall be 24 in.x 36 in. No. 14 USS ga. door sheet steel panels and no less than No. 16 USS ga. steel frames equal to Inland Steel Products Company Style M standard.

K. End Wall Arch Angle

Trim angle forming continuous closure between exposed concrete shell edge and preformed corrugated asbestoe-cement siding on both end walls shall be 2-1/2 in. $\times 2-1/2$ in. $\times 1/4$ in. aluminum angle bent to arch curve and expansion bolted to concrete shell on 24 in. centers. The angle shall be bedded in mastic as shown on the Drawings.

L. Cleanout Doors

Standard cast iron cleanout doors, frames and anchors shall be provided under this Section for installation under Section No. 3, "Concrete."

M. Miscellaneous Bolts and Anchors, Etc.

All necessary bolts, screws, expansion shields and other items required for erection shall be hereunder provided. Pipe sleeves as required shall be standard steel pipe galvanized.

N. Shop Painting

- (1) All structural steel work specified or indicated in this Section that is not galvanized shall be given one coat pf paint at the shop.
- (2) All shop and prime coats shall be red lead paint wixed according to the following formula:

Dry red lead	20	lbs.
Raw linseed oil	5	pints
Pure turpentine	2	gills
Liquid dryer	2	gills

- (3) No painting shall be done on cold or damp surfaces. Paint shall be applied with bristle brushes and the resulting surface shall dry hard and elastic without running, streaking or sags.
- (4) The paint shall be freshly mixed. Only enough for one day's use shall be mixed at one time and paint shall be stirred frequently during application to prevent separation of ingredients.

P. Structural Steel Door Frames

- (1) Door frames where indicated on the Drawings and at roll-up door openings and boiler room shall be composed of structural steel shapes, plates and bars, complete with shoe clips, concrete anchors and temporary spreaders and cross bracing. Where indicated, lintels shall be integral part of frame. In general, all parts shall be jointed by concealed shop welding or with countersunk machine screws or bolts.
- (2) Each frame shall be drilled, tapped, riveted and reinforced for hardware as required and in accordance with templets furnished under Section No. 19, "Finish Hardware."
- (3) Jamb members shall be of such length as to extend through to the rough concrete slabs and shall be secured thereto with angle clips and expansion bolts. Provision shall be made for expansion joints between slabs and frame connections by means of slip sockets as shown and detailed on the Drawings.

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- (4) Bar stops where indicated shall be secured by plug welding ground smooth or as otherwise shown.
- (5) All door frames shall be set in designated position, plumbed, braced and bolted to the supporting construction ready for building in by the masonry contractor.

P. Vault Door

- (1) The vault door shall be equal to No. 7832-2FS manufactured by the Herring-Hall Marvin Safe Company, Hamilton, Ohio, and shall bear an Underwriters' Laboratories label for two hour fire resistance.
- (2) The door shall have a clear opening of 78 in. high and 32 in. wide and shall be equipped with at least five bolts of 3/4 in. minimum thickness.
 - (3) The door shall be equipped with the following features:
 - (a) Full interlocking rear jambs.
 - (b) Tongue and groove interlock, front and top.
 - (c) Ball bearing hinges.
 - (4) Inside release device.
 - (e) Underwriters' approved re-locking device.
 - (f) Manufacturer's standard finish.
 - (g) Three tumbler combination lock.
 - Q. Entrance Door and Transon Frames and Sub-Frames
- (1) Main entrance door frames and sash and side entrance head sections shall be formed and assembled in standard No. 14 USS ga. buck steel sections conforming to ASTM A93 or No. 14 USS ga. Structural steel tubular sections as shown on the Drawings. If buck steel is used, sections shall have integral stops for both doors and sash and separate interior removable stops for glazing with oval headed screws for attachment. If structural tubes are used, separate stops shall be attached by continuous welding. In either case, frames shall be anchored to floor and ceiling construction by angle clips set 2 in. below floor and against ceiling beam and expansion bolted into concrete. Galvanized adjustable anchors, three at each jamb, shall be provided for anchorage into concrete. Between main entrance frames and between side entrance head sections and concrete felt flashing strips shall be installed and backs of frames shall be painted with bitumastic paint.

- (2) Sub-frames at windows in serrated concrete panel walls and over side entrances into which commercial projected steel windows are set shall be structural steel tubular sections, adequately anchored with expansion bolts into concrete work. Backs of sub-frame sections shall be painted with bitumastic paint and saturated felt flashing strips set between frames and concrete.
- (3) Provide temporary spreads and bracing for shipping and handling protection.
 - (4) Finishing shall be as follows:
- (a) Before forming, all inside and inaccessible surfaces of metal doors, shutters and frames shall be cleaned and then coated with a rust inhibiting paint.
- (b) ifter fabrication all oil, dirt, rust or impurities shall be removed and all metal work bonderized. All uneven surfaces shall be filled and given sufficient coats of mineral filler to provide a smooth surface, each coat to be baked and sanded to a true even surface.
- (c) A priming coat of rust inhibiting paint shall then be applied and baked on.
- (d) Finish shall consist of two successive coats of approved aluminum paint baked an and sanded and finally rubbed to finish to match approved sample.

R. Guard Chains

Guard chains at vomitories as indicated on Drawings shall be single lengths of "BBB" quality chain made up of 3/16 in. diameter heat treated alloy steel rods welded into chain 12-1/2 links to the foot and hot dip galvanized. Each length shall be provided with a Wedglok safety connecting link at one end made of heat treated drop forged alloy steel and an approved bronze snap hook at the other end for connection to eye bolt fittings. Each eye bolt fitting shall be made up of galvanized heat treated alloy steel expansion type bolt for anchoring into concrete with welded closed eye and 3/16 in. x 4 in. dia. steel washer plate double expansion bolted to concrete.

S. Inserts

Inserts shall be furnished to Concrete Contractor for setting as follows:

(1) Inserts in arched shell roof for hanging structural steel framing system shall be "Tapped" type inserts made of highest quality pressed steel in approved form equal to that manufactured by the Truscon Steel Company tapped for 3/4 in. bolts and of 2600 pound carrying capacity.

- (2) Inserts for setting multiple unit steal windows into concrete jambs and heads shall be continuous flanged V-section galv. No. 16 USS ga. Armoo ingot iron with approved integral or applied bonding arrangement. William Bayley Company Mastic surrounds may be used. Insert strips shall be provided with galvanized wire or sheet metal clips for nailing to forms. Insert assemblies for all openings shall be furnished to Concrete Contractor in ample time to meet construction progress schedule.
- (3) Inserts shall be furnished for pre-cast concrete unit work as follows:
- (a) For precast concrete seating tiers furnish for each connection of tread to riser a pair of Unistruts, each consisting of parts P-1250, 2 P-1662, 2 P-1280, P 1712 and P 102, complete with 5/8 in. screws as manufactured by the Unistrut Products Company, Chicago, Illinois.
- (b) For precast serrated concrete wall penels provide complete P-1250 assembled units as specified above.
 - (c) For the fastening of monel metal of vertical expansion joints between preformed corrugated asbestos cement panel siding and concrete at end walls, inserts shall be Unistruts, one consisting of parts P-4269-16 in. including 28 anchors No. P-4662, one top end cap P-4280, and one consisting of parts P-4270 plus 21 in., including 32 anchors No. P-4662, one top end cap P-4260 and 21 P-4006-1420 mats and stainless steel screws.
 - (4) Twelve (12) inserts shall be provided to be set in concrete of columns at south side of service area on arena floor level; inserts shall be tapped type made of highest quality pressed steel, tapped for 3/4 in. bolts, capacity 2600 lbs., equal to those manufactured by the Truscon Steel Company.
 - (5) Similar inserts, 56 in number, shall be provided to be set in Arena floor at main vomitories for the future attachment of animal chutes, and shall be provided with flush screw plugs.
 - (6) Similar inserts, 24 in number, shall be placed where directed in Arena floor, and shall be provided with flush screw plugs.

SECTION NO. 13 - METAL TOILET AND SHOWER PARTITIONS

The "General Conditions Governing All Contracts" and the "Specific Requirements" for Contract No. 1 shall apply to all work of this Section.

1. SCOPE

The work under this Section shall consist of farnishing all labor, materials and equipment necessary and required to complete all metal toilet and shower partitions as shown on the Drawings, as herein specified, or as reasonably inferable from the Drawings and Specifications, generally as follows:

- A. Standard flush-type toilst scapartments with doors.
 - B. Shower compartments without doors.

2. MATERIALS

- A. Sheet steel shall be No. 20 ga. full cold rolled, stretcher leveled, furniture steel.
- B. Cores for partitions, stiles and doors shall be standard rigid, sound-deadening fibre board at least 7/8 in. thick.
 - C. Head rails shall be 1 in. x 1-1/2 in. tabular steel.
- D. All hardware shall be heavy-pattern chrome-plated brass, including stile bases, curtain rods, surface-type gravity hinges and pivots, combination coat hook and rubber tipped bumpers, slide bar latches, combination door stop and keepers.
- R. Paper dispensers, one for each toilet compartment, shall be chromeplated brass "Onliwon," as manufactured by the American Paper Company, or an approved equal.
- I. Seats for shower compartments shall be of plain sawn clear oak, filled, shellacked, and varnished two coats prior to delivery.

3. FABRICATION

Partitions, compartments, stiles or pilasters and doors shall be made of two sheets of steel, assembled over and cemented under pressure to the core board. Edges of steel sheets shall be folded to form continuous sealed seams bound together by means of outside oval locking strips. All screws shall be chrome-plated brass.

4. SHOP FINISH

Assembled metal units shall be thoroughly cleaned of all foreign materials and bonderized. Prior to priming, all surfaces shall be washed with benzine and then primed with sublimed blue lead, baked on, and two coats of baking enamel, sprayed on and baked separately. Colors shall be standard as selected by the Architect-Engineer.

5. PROTECTION

Protection shall be provided in crating, shipping and handling to prevent scratching, marring and denting of metal surfaces. Damaged panels shall be subject to rejection by the Architect-Engineer. Small abrasions may be enameled to match existing finish at the building by the Contractor or the manufacturer subject to approval of the Architect-Engineer.

6. HISTALLATION

All partitions shall be erected plumb and true to wall lines, and each shall be fastened to back and side walls with two steel stirrup brackets finished to match partitions and secured with chrome-plated expansion bolts. Pilasters shall extend from floor to headrails. All doors shall be the same height as and align with partition panels. Gravity hinges shall be set to stand open at an angle of between 15 and 45 degrees for compartments. Doors shall move freely with full bearing on stops. Stile bases shall be securely anchored through flooring into concrete floor construction with chrome-plated expansion bolts. Oak seats shall be secured to partitions with chrome-plated brass angle brackets and bolts.

7. CLEANING

Cleaning and touch-up at completion shall be thorough. Adequate protection shall be provided to prevent damage by other trades.

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SECTION NO. 14 - CERAMIC TILE FLOORING

The "General Conditions Governing All Contracts" and the "Specific Requirements" for Contract No. 1 shall apply to all work of this Section.

1. SCOPE

The work under this Section shall consist of furnishing all labor, materials and equipment necessary and required to complete all ceramic tile flooring as shown on the Drawings, as herein specified, or as reasonably inferable from the Drawings and Specifications, generally as follows:

A. Unglased ceramic tile for toilet rooms.

- B. Non-slip ceramic tile for shower rooms and compartments and contiguous dressing spaces.
- C. Unglased ceramic tile for other areas specifically noted on Drawings.

2. MATERIALS

- A. Tile shall be 1 in. $x \ge in$. $x \le 1/4$ in. catmeal and brown unglased ceramic, paper sheeted, as manufactured by a member of the Tile Council of America.
- B. Adhesive shall be Miracle Adhesive Corporation's Type MT or an approved equal.
- C. Cement for joint grouting shall be of a waterproof brand acceptable to the tile manufacturer and the Architect-Engineer.
- D. Sand for grout shall be clean, free from clay, loam, organic matter or other impurities, and graded from fine to coarse, with fine grains predominating.
 - K. Water shall be of potable quality.
- F. Before proceeding with the work, the Contractor shall furnish to the Architect-Engineer a Certificate of Grade for the tile in the form adopted by the Tile Council of America.
- G. Tile shall be delivered in original unopened sealed containers on or in which there shall be shipping marks and other designations corresponding with that on the grade certificate. Containers shall be opened only after approval by the Architect-Engineer, who will compare approved samples with delivered materials before approval is given.

3. WORKMANSHIP

A. General

- (1) Tile shall be set and shall set up in temperatures above 32° F.
- (2) Rooms and spaces in which tile work is being installed shall be closed to traffic until the tile has set up.

B. Grout

(1) Grout for all joints shall consist of one part of waterproof cement and two parts of sand. The grout shall be mixed with water to the consistency of thick cream.

C. Setting Tile

- (1) All tile shall be applied directly to the concrete base with adhesive, and without priming or otherwise treating the surface of the concrete.
- (2) The concrete surface shall be dry and cleaned of all dust, dirt, loose particles or other foreign substances.
- (3) Adhesive shall be spread uniformly, using a sawtooth trowel, notched 3/16 in. deep. Only an area equivalent to that of a single sheet of tile shall be spread with adhesive at one time. Ridges, evenly spaced shall be troweled in the adhesive. Excess adhesive shall not be allowed to work up between tile joints.
- (4) Not more than 6 sq. ft. of adhesive shall be spread in advance of tile setting. In areas where fitting is necessary, tile shall be fitted before the adhesive is spread. The tile sheet shall be laid on the adhesive bed, using pressure but without a sliding motion.
- (5) Joints between all units of ceramic tile and between the abutting sheets as laid shall be uniform and equal to approximately 1/16 in.
- (6) Approximately two hours after tile is laid, it shall be tapped lightly with a soft beater to level up the edges.
- (7) The tile shall be wetted, and the paper stripped off. Any necessary adjustments in alignment shall be made. After the tile has been set, care shall be taken to prevent shifting under pressure. Pounding, walking or using kneeling board upon tile face until adhesive has thoroughly set shall not be allowed.

D. GROUTING

- (1) Excess adhesive shall be completely removed from joints, using a sharp tool.
- (2) Grout shall be spread with a squeegee, and well worked into joints.
- (3) Surplus groupt shall be removed and the faces of the tile left clean.
- (4) Grout that has started to set shall not be used. The use of retempered grout will not be permitted.

E. Final Cleaning and Protection

- (1) As soon as the work in this Section is completed, the Contractor shall carefully reclean all surfaces. All defective materials shall be cut out and replaced with perfect material, all damage repaired and any required dressing or rubbing done, leaving the entire work clean and in perfect condition.
- (2) Where acids are used for cleaning tile work, extreme care shall be taken to protect metal fittings and finished hardware against injury. The use of hydrochloric or muriatic acid is prohibited in rooms where chromium plated fittings or hardware have been or are to be installed. The Contractor will be required to replace any metal fittings or hardware injured through the use of cleaning agents.
- (3) After the work has been completed and the surfaces cleaned, it shall be protected by a layer of red resin paper with all edges lapped and taped.

SECTION NO. 15 - RESILIENT FLOORING

The "General Conditions Governing All Contracts" and the "Specific Requirements" for Contract No. 1 shall apply to all work of this Section.

1. SCOPE

The work under this Section shall consist of furnishing all labor, materials and equipment necessary and required to complete all resilient flooring as shown on the Drawings, as herein specified, or as reasonably inferable from the Drawings and Specifications, generally as follows:

- A. Asphalt tile flooring and base.
- B. Rubber tile flooring and asphalt tile base.
- 2. WORK NOT INCLUDED IN THIS SECTION
 - A. Ceramic tile flooring.
 - B. Terrasso flooring.
- 3. QUALIFICATIONS OF INSTALLERS

Installation of all composition flouring shall be made by Contractors authorized and approved by the manufacturers of the approved flouring. Workmen shall be competent men skilled in the laying and finishing of the composition floor common to his trade.

4. MATERIALS

A. Asphalt Tile .

- (1) Asphalt tile flooring shall be "Tile-Tex" as manufactured by the Tile-Tex Company, Inc., Chicago Heights, Illinois, "Kentile" as manufactured by David E. Kennedy, Inc., Brooklyn, N.Y., or approved equal.
- (2) Asphalt tile shall be 9 in. square and 3/16 in. thick and shall be made of high melting point asphalts, non-fading mineral pigments, asbestos fibers and blending agents, entirely free from dirt, grit, lumps, roofing granules or unmixed coloring.
- (3) Colors shall be as selected from Group B tile and shall conform to color samples approved by the Architect-Engineer.
- (4) Base shall comply with all requirements for asphalt tile flooring and shall be 3/16 in. thick x 5-1/2 in. or 6 in. high in accordance with manufacturer's standards. Base shall be premolded with rounded top and cove base, with one piece internal and external corners. Color shall be black.

- (5) Primer for concrete sub-floors shall be an asphaltic priming compound having a spreading capacity of not less than 500 sq. ft. per gallon. Primer shall be a product of or as recommended by the asphalt tile manufacturer.
- (6) Adhesive shall be No. CF-8 as manufactured by the Tile-Tex Company, or an approved equal, and shall be water-resisting asphaltic cement manufactured or recommended by the tile manufacturer.

B. Rubber Tile

Rubber shall be self-sealing canvas-backed pure gum cushion-core rubber tiles 9 in. x 18 in. x 5/8 in. manufactured by Adams Marshall Company, 1202 Monroe Street, Hynes, California.

5. WORKMANSHIP

A. Preparation

- (1) Installation shall conform in every respect to the manufacturer's printed instructions.
- (2) Temperatures of rooms and sub-floors shall be maintained at a minimum of 70° F. for several days before, during and after the application of asphalt tile.
- (3) Base shall be firmly cemented to the wall. Corner pieces shall be accurately installed and junctions at doors shall be accurately scribed.
- (4) Floor tiles shall be laid to insure good contact with close, even joints and with all finished surfaces smooth and in a true plane. Opposite lines of edge tile in each space shall be equal in width. Tiles shall be neatly cut and fitted around pipes and projections.
- (5) In areas where an edging is required, an approved type edging shall be installed, screwed and cemented to the concrete in accordance with the manufacturer's instructions. It will be assumed that an edging will be required wherever tile floors abut a concrete floor not surfaced or where it joins any other floor finish applied over sub-flooring. Drawings call for metal saddles at doors which shall be furnished under Miscellaneous Metals Section; edgings shall be provided wherever also mecassary.
- (6) Rubber tile shall be layed in running bond in accordance with the manificturer's specifications.

C. Protection, Cleaning and Waxing

D 00224

- (1) Immediately after laying, finished floor surfaces shall be covered with Kraft paper or other approved covering, lapped and cemented at edges and ends until ready for waxing.
- (2) When so directed, and only after the floor tile has thoroughly bonded to the sub-floor, the Contractor shall remove the paper together with all foreign substances from floor and base. Two coats of approved floor wax shall then be applied. Each coat shall be machine buffed to a well polished surface.

SECTION NO. 16 - TERRAZZO FLOORING

The "General Conditions Governing All Contracts" and the "Specific Requirements" for Contract No. 1 shall apply to all work of this Section.

1. SCOPE

The work under this Section shall consist of furnishing all labor, materials and equipment necessary and required to complete all terraszo flooring as shown on the Drawings, as herein specified, or as reasonably inferable from the Drawings and Specifications, generally as follows:

- A. Terraszo flooring in Main Entrance Lobby.
 - B. Setting bed.
 - C. Dividing strips.
 - 2. WORK NOT INCLUDED IN THIS SECTION
 - A. Ceramic tile flooring.
 - B. Resilient flooring.
 - 3. MATERIALS

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- A. Governing Specifications
- (1) The Contractor shall furnish and install all materials in accordance with the current edition of "Specifications for Terraszo Work," as plublished by the NTMA, 1420 New York Avenue, N.W., Washington, D.C.
- (2) Materials shall be delivered and stored at site in accordance with recommendations of the NTMA.
 - B. Quality Requirements

D 00225

- (1) Marble granules shall be one-third each of Black, Cariff Green and Sylvan Green, No. 1 and 2 chips.
 - (2) Cement shall be Portland cement conforming to ASTM C150, Type I.
- (3) Pigment shall be non-fading and lime-proof Green Mineral. 31 oz. of pigment shall be mixed with each bag of cement.
- (4) Dividing strips shall be zinc alloy 1/8 in. thick, 1-1/4 in. deep, of top heavy type, having top edging at least 3/8 in. deep.
- (5) Abrasive aggregate shall be No. 00 Alundum, Norton Company, Worcester, Mass., or an approved equal, hard tough aluminum oxide particles, green in color.

4. WORKMANSHIP

A. Preparation of Concrete Surfaces

- (1) Concrete sub-flooring and bounding partitions and floor angles of partitions which are required to be embedded in flooring shall have been installed.
- (2) The Contractor shall examine all surfaces and shall not lay terrazzo under conditions which are detrimental to best modern practice.
- (3) Concrete surfaces shall be thoroughly cleaned of plaster droppings and other foreign materials and debris, and shall be slushed with neat cement grout to insure good bonding. The total depth required for terraszo and underbed shall be 2 in

B. Inderbed

Underbed shall be mixed in the proportion of 1 part Portland cement and 4 parts coarse screened sand by volume. The mixture shall be spread evenly and brought to a level 5/8 in. below the finish floor level.

C. Strip Setting

- (1) While the underbed is still plastic, the dividing strips shall be imbedded to conform to pattern shown on the Drawings.
- (2) Dividing strips shall be set straight, plumb and true to structural lines and bounds. Strips shall be set at bounds of terrazzo area, adjoining other flooring materials.

D. Placing

1-4

- (1) The topping shall be proportioned in the ratio of 150 lbs. of marble granules to 50 lbs. of abrasive aggregate and 100 lbs. cement.
- (2) The ingredients shall be mixed dry and water added after the mixing to make the mix plastic but not flowing.
- (3) Topping shall be poured into spaces formed by the dividers and rolled into a compact mass, using a heavy metal roller until all superfluous water is extracted.
- (4) The mass shall then be hand trowelled to an even surface flush with the top of strips. The finished surface shall show a minimum of 70% marble granules.
- (5) The flow shall be kept moist during these operations and shall be cured for at least 6 days. The curing method shall be that recommended by the NTMA.

E. Finishing

When flows have attained a hard set, they shall be machine rubbed with carborundum grit stones. This shall be followed by a light grouting of pure Portland cement of same type and color as the matrix, filling all voids. This grout shall remain until final cleaning.

F. Cleaning

- (1) Floors shall have the final grouting coat removed by machine, using a fine carborundum grit, not sooner than 72 hours after grouting.
- (2) All work shall be washed thoroughly and left in acceptable condition. Acids shall not be used in cleaning.

SECTION NO. 17 - LATHING AND PLASTERING

The "General Conditions Governing All Contracts" and the "Specific Requirements" for Contract No. 1 shall apply to all work of this Section.

1. SCOPE

The work under this Section shall consist of furnishing all labor, materials and equipment necessary and required to complete all lathing and plastering as shown on the Drawings, as herein specified, or as reasonably inferable from the Drawings and Specifications, generally as follows:

- A. Three coat plaster on metal lath.
 - B. Two coat plaster on masonry.
 - C. Two coat vermiculite plaster on masonry, with hard white finish, 4- at points noted on Drawings.

- D. Furring and lathing, including corner beads and any other required accessories.
- E. Suspension framing for hung cailings.
- 2. ITEMS FURNISHED BUT NOT SET
 - A. Concrete inserts for suspension framing.
- 3. WORK NOT INCLUDED IN THIS SECTION
 - A. Raking of joints in concrete mesonry partitions and unglazed surfaces of structural facing tile partitions noted on Drawings to receive plaster.

4. MATERIALS

- A. Delivery and Storage
- (1) All materials shall be delivered in umbroken packages plainly marked with the brand and manufacturer's name. Water marked, rusted, or etherwise damaged or deteriorated materials will be subject to prompt rejection and immediate removal from the premises by the Contractor.
- (2) All materials shall be stored in a dry location and protected against physical damage, deterioration, or the intrusion of foreign matter.

B. Flastering Materials

- (1) Gypsum plastering materials and lathing and furring shall be in strict accordance with the ASA Standard Specifications for Gypsum Flastering A42, insofar as they apply to this building, and are hereby made a part of this Section to the same extent as if they were herein written in full.
- (2) Vermiculite plaster shall be premixed approved fibred gypsum and vermiculite aggregate having a density of 10 lbs. per cu. ft. and no part retained on a No. 10 screen when mixed in the proportions of 4 parts of gypsum and one part of vermiculite by weight and packaged under the name of Masco Fireproof Specification Plaster, or Zonolite.
- Market (3) Sand shall conform to ASTM C35, latest edition.
- (4) Binder shall be well-beaten, clean long hair, or an approved type of fibre.
- (5) Cement shall be Portland cement conforming to ASTM C150, latest edition.

C. Metal

- (1) Hangers and channels shall be rolled shapes, shop painted. Runner channels shall be 1-1/2 in. and furring channels 1 in.
- (2) Ceiling inserts shall be I in. x 3/16 in. formed as shown on the Drawings, drilled for 3/8 in. bolt connection to I in. x 3/16 in. strap hanger. The Contractor shall have the option to substitute "Shurebond" Hanger Inserts, Standard Type, for use with No. 8 annealed galvanized wire hangers. In the Main Entrance Lobby screw type 3/8 in. inserts shall be provided and 3/8 in. suspended rods shall be "up-ended" and threaded. The Contractor shall make sure that the required number of inserts called for are supplied in adequate time for installation under Section No. 3 "Concrete."
- (3) Suspended construction shall include all necessary bolts, inserts, clips, fastenings and other material necessary to make a complete installation. Clips used to secure furring to runner channels shall be 3 strand wire saddle ties or approved equal.
- (4) Lath shall be 3/8 in. rib expanded metal lath weighing not less than 3.4 lb. per sq. yd. and shall have a heavy coat of black asphaltum paint.

Wire shall be No. 18 ga. soft annealed galvanized wire.

D 00229

Corner beads shall be not dipped galvanized No. 24 ga. metal 1-1/4 in. scalloped wing type with 1 in. radius bullnose.

5. WORKMANSHIP

17:30

A. General

- (1) The Contractor shall carefully examine the Drawings for the scope of the plastering, and shall furnish and install all additional hangers, supports or other items necessary to complete the work in accordance with the intent of the Drawings and Specifications.
- (2) The Contractor shall carefully examine the Drawings of the various Mechanical and Electrical Contracts and provide for the enclosing of any work of these trades requiring enclosures.
- (3) Suspended ceilings shall not be placed until all piping, pipe covering, wiring or other service work has been installed, tested and approved.

B. Suspended Ceilings

- (1) Hangers in toilet rooms shall be formed from 1 in. x 3/16 in. flat steel bars arranged for attachment to ceiling inserts (furnished under this Section and installed under Section No. 3 "Concrete") and punched for 3/8 in. bolting to channel runners. Hangers shall be spaced not over 4'-0" o.c. each way.
- (2) Hangers for Main Entrance Lobby shall be 3/8 in. dia. rods spaced 3'-0" both ways.
- (3) Runner channels shall be spaced 4!-0" o.c. for toilet room ceilings and 3!-0" for Main Entrance lobby ceiling.
- (4) Furring channels shall be spaced 12 in. o.c. and secured to the runners with at least 18 ga. 3-strand galvanized wire saddles.
- (5) Metal lath shall be tied to furring with No. 18 ga. wire not over 6 in. o.c., ends and sides shall be lapped not less than 1 in. and securely laced with No. 18 ga. wire to each furring number and at intervals of not more than 6 in.
- (6) Where the lath finishes against masonry extend the runners or furring channels into the masonry for a minimum of 2 in.
- (7) Where wall surfaces receive plaster, the lath shall be brought down (returned) for a distance of 6 in. and well secured to masonry. Where window and door reveals are plastered, wire lath shall be installed.
- (8) All furring and lathing shall be level, true and rigid, leaving all surfaces in proper condition to receive plastering and in general 3/4 in. back of the finish line for gypsum plaster.
- (9) All furring members, hangers, clips, etc. shall be completely cleaned of rust and thoroughly dipped or painted with asphaltum varnish before erection.

J 00230

(10) After the work of other trades has been finished, the Contractor shall do all cutting and framing around all fixtures, cutlet boxes, piping, conduits and other appurtenances or supports extending through the furring.

C. Gypsum Plaster

- (1) The mixing of all plaster materials whether by machine or by hand, shall be done in a manner approved by the Architect-Engineer.
- (2) All ingredients shall be accurately measured in proper proportions and mixed to the desired and uniform consistency. Methods of measuring shall be used that will insure separate, uniform measurements at all times.
- (3) The scratch coat shall be mixed as follows: I part Gypsum to 2 parts of sand by volume with sufficient hair or fiber to form a binder.
- plaster to 3 parts of sand.
 - (5) The finish coat shall consist of 3 parts Gypsum lime putty, gauged with 1 part of calcined plaster.
 - (6) Under no conditions will the use of retempered materials which have taken initial set be permitted.
 - (7) When gauging materials are used, they shall be incorporated at the time of mixing, and only sufficient mortar shall be mixed at one time as can be applied before material sets.
 - (8) The Contractor shall prepare all surfaces to be plastered in suitable condition to receive and retain the plaster coats. This includes the removal of dirt and loose particles, furring and lathing where irregularities in the masonry are such as to require it, and wetting down all masonry before applying plaster thereto.
 - (9) Concrete surfaces to be plastered shall be given a preparatory bond of approved manufacture.
 - (10) No plaster work shall be executed in air temperatures of less than 40° F.
 - (11) Gypsum plaster shall finish approximately 7/8 in. thick for 3-coat work on metal lath and 5/8 in. thick for 2-coat work on masonry.
 - (12) Work on metal lath shall consist of scratch, brown and finish coats. Scratch coat may be omitted from plaster on masonry walls.
 - (13) Concrete surfaces to receive plaster shall be given a bond coat followed by two coats as for masonry.
 - (14) The scratch coat shall be applied with sufficient pressure and material to form good keys and a well covered surface. The surface shall be well scratched in both directions. The scratch coat shall be allowed to set hard and firm before the brown coat is applied.

- (15) The brown cost shall be applied up to screeds or grounds, shall be well rodded, screeded and floated with all angles true, straight and plumb. Screeds shall be provided at all angles, corners, and every 8 ft.
- (16) The finish coat shall be applied when the brown coat is dry. This coat shall be so applied that all surfaces are straight and true, smooth, even, plumb and out-of-wind, and flush with all groudn, corners and angles. All intersections shall be straight, sharp and true. The finish coat shall be trowelled to a hard, smooth surface having an eggshell finish.
- (17) Care shall be taken in trowelling and finishing around all electrical outlets, pipes, hangers, fixtures, etc., so as to secure a finish surface at these locations equal to that of the remainder of the work.
- (18) Any plaster or dirt which may have been splashed on outlets, etc., shall be cleaned off.
- (19) In the application of all trowel finishes, excessive use of water shall be avoided.

D. Vermiculite Plaster

- (1) The minimum amount of water necessary to make a workable mix shall be added to the prepared plaster, in strict accordance with the manufacturer's directions.
- (2) Plaster shall be applied in two coats, scratch and brown combined, and hard finished to a minimum thickness of 1 in.
- (3) The first coat shall be vermiculite, shall have a thickness of 7/8 in., and shall be applied as specified for the first coat of gypsum plaster applied to masonry.
- (4) The second coat shall be hard plaster as specified for the finish coat of gypeum plaster.

E. Patching

- (I) The Contractor shall do all patching and pointing after other trades made necessary by the ordinary sequence of the work around all pipe sleeves, hangers, openings, door frames and other contiguous work, making a finished workmanlike job.
- (2) Any finished plaster surfaces that become loose or evidence improper bond shall be cut out and replaced with new work, the area removed being made sufficiently larger to overcome the appearance of patching.

F. Cleaning

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(1) All plaster on items or surfaces not intended to receive plaster shall be carefully removed. Any work damaged in cleaning or which cannot be cleaned to the satisfaction of the Architect-Engineer shall be removed and replaced at no expense to the Owner.

- (2) When the Contractor has finished his work, he shall remove from the building all staging and tools of every description used in the work.
- (3) He shall remove all debris resulting from his work and leave the premises broom clean.

SECTION NO. 18 - GLASS AND GLAZING

The "General Conditions Governing All Contracts" and the "Specific Requirements" for Contract No. 1 shall apply to all work of this Section.

1. SCOPE

The work under this Section shall consist of furnishing all labor, materials and equipment necessary and required to complete all glass and glasing as shown on the Drawings, as herein specified, or as reasonably inferable from the Drawings and Specifications, generally as follows:

- A. Steel windows.
- B. Main entrance side panels and transoms.
- C. Exhibit area fixed windows.
- D. Vision panels in doors as indicated on Drawings.
- E. Ticket booth windows and deal plates.
- F. Mirrors in toilet rooms.
- G. Glazing clips, putty, etc.
- H. Glass shelves and brackets in First Aid Rooms.
- 2. MATERIALS

142-

- A. All glass other than for mirrors shall conform to the requirements of FS-DD-G-451 "Glass; Flat for Glazing Purposes." Delivery shall be as required and storage shall be in safe location as directed. Materials shall not be unpacked or uncrated until installed. Marked samples shall be submitted to Architect-Engineer for approval. These will be matched to delivered materials, which shall be factory labeled on each pane of glass.
- B. Double strength A quality glass free from waves, blisters or other imperfections shall be installed in all steel windows except in toilets.
- C. Obscure glass for toilet room windows shall be 1/8 in. thick Factrolite as manufactured by the Mississippi Glass Company or an approved equal.
- D. Polished plate glass 1/4 in thick glazing quality shall be used in side panels, vision panels and transoms of main entrance and for ticket booth windows.
- E. Heavy flat drawn A quality 7/32 in. sheet glass shall be used in large fixed wood panels at main entrance and interior door vision panels.

- F. Mirrors shall be 1/4 in. polished plate glass conforming to Commercial Standards OS-27-30 issued by the Department of Commerce, Quality AA, in chrome plated brass frames fitted with concealed thief-proof hangers. Sizes shall be as shown on the Drawings.
- G. Putty for steel sash shall conform to FS-TT-P-791 Grade B or approved steel window glazing compound. Putty for wood sash shall be made of pure linseed oil, pure whiting, and at least 10% pure white lead.
- H. Deal plates for main entrance ticket booths shall be 3/4 in. polished and beveled black carrara structural glass as manufactured by Pittsburgh Plate Glass Company or an approved equal.

L. Glass shelves for First Aid Rooms shall be 2071R as manufactured by the Charles Parker Company Meriden, Conn., or an approved equal, and shell be complete with chrome plated brackets and concealed screws.

3. INSTALLATION

- A. Glass shall be cut accurately to fit openings and set with equal bearing for the entire width of panes in a secure manner to prevent rattling and breakage, and shall be weathertight in all exterior work. All rebates for glazing shall be prime painted with lead and oil paint under Section No. 20 "Painting" before clips, darts and putty are applied. Putty shall be neatly run in straight lines parallel with glazing rebates; corners shall be carefully made; all excess putty shall be removed and surfaces left clean.
- B. Glass in steel sash shall be held in place with spring wire glazing clips and glazing compound or putty. Obscure glass shall be set with smooth face outside.
- C. In wood and metal sash and doors, stops where called for shall be removed, rebates painted, glass back and face puttied, and stop reset without damage.
- D. Glass in metal doors shall be set in gaskets of felt cemented in place.

4. CLEANING AND BREAKAGE

A. At completion, all dirt stains, excess putty, etc., shall be removed and all glass shall be cleaned and polished. All glass shall be protected from damage during building operations. Glass broken or scratched prior to acceptance of project for any cause shall be replaced at the Contractor's expense.

SECTION NO. 19 - FINISH HARDWARE

The "General Conditions Governing All Contracts" and the "Specific Requirements" for Contract No. 1 shall apply to all work of this Section.

1. SCOPE

The work under this Section shall consist of furnishing all finish hardware required by the Drawings, herein specified, or as reasonably inferable from the Drawings and Specifications, generally as follows:

- A. Finish hardware for items described under Section No. 10,
- B. Finish hardware for items described under Section No. 11, "Metal Doors and Frames."
- C. Finish hardware for items described under Section No. 12, "Miscellaneous Metals."
- D. Masterkeying system.
- 2. RELATED WORK NOT INCLUDED IN THIS SECTION
 - A. Rough hardware.
 - B. Installation of finish hardware.
 - C. Hardware for windows.
 - D. Hardware for relling steel doors.
 - -E. Hardware for toilet and shower compartments.
 - F. Hardware for vault door.
 - G. Hardware for access doors.

3. HARDWARE LIST

A. The hardware list appended to this Section is for the bidders' convenience only and is not intended to be complete. The Contractor shall prepare and submit his own detailed schedule in triplicate to the Architect-Engineer for approval. All hardware shown on the schedule shall be complete and ample for the service required.

4. MATERIAL

- A. All hardware shall conform to the requirements of all local and State authorities having jurisdiction and to the requirements of the Underwriters' Laboratories, Inc. The Contractor shall check those requirements with the hardware herein specified, and he shall report any discrepancies to the Architect-Engineer.
- B. Each of the hardware items shall be packed separately, complete with all trimmings, screws, bolts, washers, etc., clearly labeled, numbered and delivered ready for application.
- C. Finish of exposed parts of bolts or screws shall match the finish of the article secured.
- Del The Contractor shall furnish schedule and proper templates of hardware to door and door frame manufacturers. Butts and other hardware items which can be more readily applied in the shops than in the field shall be furnished in ample time to metal frame and door manufacturers.
- E. Hardware herein listed is selected from catalogs of the Russell-Erwin Manufacturing Company, Oscar C. Rixson Company, and Stanley Works. Hardware furnished shall be equal or similar to that scheduled in quality, weight, design and operation.
- F. Door closers shall be of the type and sizes scheduled and shall be furnished with key valves. Six valve keys shall be furnished for door closers.
- G. Door closers and their brackets shall be sprayed a commercial bronzed finish similar to Russell-Erwin Manufacturing Company's Marcon Bronze.
- H. Butts shall be wrought steel, cadmium plated and furnished with a factory prime coat of paint.
 - I. Overhead holders shall be steel with electro-galvanized finish.
- J. All other exposed hardware shall be a dull bronze finish, U.S. 10, without lacquer.
- K. Kickplates shall be bronze with beveled edges three sides and of gage and height as scheduled.
- L. Lock faces, lock strikes and flush bolts shall have flat, beveled, rebated or rounded fronts. Knobs shall be east bronze spheriod type 2-1/4 in. dia. with outer knob pinned to spindle and inner knob provided with sleeve guard to cover set screw. Roses shall be east bronze, 2 in. dia.

5. KEYING

- A. All cylinders shall be subject to the grand master key.
- B. The building shall be master keyed in two sections.
- C. Doors to closets in offices, first aid rooms, and other rooms shall be subject to the grand master key and not any master key.
 - D. Office section and rooms shall be master keyed in one set.
- E. Other locks shall be master keyed in a set different from office section.
- F. The Contractor shall furnish three grand master keys and four master keys for each Section
 - G. Each lock and padlock shall be furnished with two keys; and locks in general shall be keyed differently, except that locks shall be keyed alike where two or more locks occur in the same room or space.
 - H. All keys shall be stamped with an identifying number.

GROUP #1 - - Doors #101 - 102 - 105 - 109 - 179 125 - 127 - 130 - 172 173 - 174 - 175 - 204 220 - 231 - 232 - 401

Each

 $1\frac{1}{2}$ - Pair Butts BBK 146P - $5 \times 4\frac{1}{2}$ 1- - Set Locks 6457 B3K. XSG Bristol Box Strike 1- - Closer C.

Knob Bumpar Stop 3592 where required.

GROUP #2 - - Double Doors #103 - 104 - 107 304 - 305 - 307 - 308

Each

11 - Pair Butts BBK 146P 5 x 42

2 - Flush Bolts 194 Rod 12

1- - Set Locks 6456 B3K. ISG Bristol Box Strike

1- - Closer C.

Knob Bumper Stop 3592 where required.

GROUP #3 - - Double Doors #106 - 110 - 111 - 137 - 180

Bach

3- - Pair Butts BBK 128P - 5

2- - Flush Bolts 194 Rod 12"

1- - Set Locks 6457 B3K. ISG Bristol Box Strike

1- - Closer C.

Knob Bumper Stop 359 where required.

CROUP #4 - - Doors #108 - 112 - 303 - 306

Rach

12- - Pair Butts BBK 146P - 5 x 42

1- - Set Locks 6456 B3K. XSG Bristol Box Strike

1- - Closer C.

1- - Knob Bumper Stop 3592

GROUP #5 - - Double Doors with mullion between #126 - 176 - 209 - 215

Each

3- - Pair Butts BBK 146P - 5 x 42

2- - Rim Exit Bolts 564

. 2- - Closers C with Bracket 128 C

2- - Overhead Stops Rixson 38-23 galv. with paint

GROUP #6 - - Doors #113

1 - Pair Butts BBK 146P - 5 x 42

1- - Set Locks 1456 B3K. ISG Bristol Box Strike

1- - Closer C-1

GBOUP #7 - - Doors #114 - 118 - 132 - 138 - 149 - 151 - 178

155 - 158 - 161 - 164 - 168 - 171

203 - 206 - 207 - 210 - 214 - 217

218 - 221 - 225 - 226 - 229 - 235 236 - 237 - 239

1- Set Locks 1456 BBK XSG Bristole Box Strike 1- Stop ABI

Applied on door or wall as conditions require.

GROUP #8 - - Doors #115 - 165 - 170 - 224

Bach

12 - Pair Butts BBK 146P - 4x4

1- - Set Locks 236 B3K. XSG Bristol - Box Strike

1- - Stop ARI

Applied on door or wall as conditions require.

GROUP #9 - - Doors #116 - 139 - 141 - 148 - 152 - 159

Rach

1 - Pair Butts BB 146P - 4 x 4

1- - Set Locks 11224 B3K. ISG Bristol Box Strike

1- - Stop ARI

GROUP #10 - Doors #117 Battery of 8 Doors

Battery of 8 Doors 201

223 Battery of 8 Doors

Rach

146P - 5 x 4 BEK 12- - Pair Butts

8- - Exit Bolts 566

X Outside Pull Grip 076

8- - CloserD and Bracket 128D

8- - Kick Plates 16 ga. BE 10" x Door width less 12"

8- - Overhead Holder Rixson 38-27 galv. for paint

GROUP #11 - Double Doors #119 - 124

Bach

3- Pair Butts BBK 146P - 5 x 43

1- Set Exit Bolts 60 x 566

X Special Strike S for 566

No Outside Trim

2- Overhead Holders Rixson 38-23 galv. for paint

GROUP #12 - Doors 128 Battery of 7 Doors

102- Pair Butts BBX 146P - 5 x 42

7- Exit Bolta 566

7- Closer D with Bracket 128D

7- Kick Plates 16 ga. BE 10" x door width less 12"

7-Overhead Holders Rixson 38-27 galv. for paint

GROUP 13 - Doors 129 Battery of 4 Doors

6- Pair Butts BBK 146P - 5 x 42

4- Sets Locks 6457 B3K. X36 Bristol Box Strike

4- Closers D and Bracket 128D

4- Overhead Holder Rixson 38-27 steel galv. for paint

GROUP #14 - Doors #131 - 133 - 134 - 135 - 136

140 - 145 - 147 - 153 - 154 - 160

163 - 166 - 169 - 227 - 228 - 230

Each

13- Pair Butts BB 146P - 43 x 42

1- Set Lock 1456 B3K. ISG Bristol Box Strike

1- Dloser B

1- Base Stop 1663

1- Card Holder 1914 Corbin Cab. Lock Co. Card Space

GROUP #15 - Doors #143 - 144 - 146

Rech

12- Pair Butts BBK 146P - 42 x 42

1- Set Lock 1458-5/8 B3K. ISG Bristol Box Strike

1- Closer B

1- Base Stop 1662

GROUP #16 - Doors #150 - 162

Lach

13- Pair Butts BBK 146P - 42 x 42

1- Set Locks 2362 B3K. XSG Bristol - Box Strike

1- Base Stop 1662

<u>QROUP #17 - Doors #156 - 157 - 167 - 202 - 205</u> 208 - 216 - 219 - 222 - 233 234 - 238

Rach
12- Pair Butts BBK 146P - 5 x 42 .

No Lock

- 1- Push Plate 1016 16 x 4
- 1- Pull 474
- 1- Closer C
- 1- Kick Plate 16 ga. BE 10" x Door width less 12"
- 1- Knob Bumper Stop 359 for Doors that open less 1300

GROUP 18 - Doors #211 Battery of 4 Doors 213 Battery of 4 Doors

- Pair Butts BBK 146P - 5 x 45

4- Brit Bolts 566

I Outside Pull Grip 076

- 4- Closer D and Bracket 1280
- 4- Kick Plates 16 ga. BE 10" x Door width less 12"
- 4- Overhead Holder Rixson 38-27 galv. for paint

GROUP #19 - Doors 212 Battery of 8 Doors

- 12- Pair Butts BBK 146P 5 x 43
- 8- Mortise Bolts 167 with turn 554 Box Strike
- 8- Closer D and Bracket 128D
- 8- Kick Plates 16 ga. BE 10" x Door width less 12"
- 8- Overhead Holders Rixson 38-27 galv. for paint.

GROUP #20 - Doors #301 - 302 - 402

Rach

- 12- Pair Butts BBK 146P 5 x 42
- 1- Set Locks 6225 B3K.ISG Bristol Box Strike
- 1- Closer D with Bracket 128D
- 1- Overhead Holder Rixson 38-27 galv. for paint

CROUP #21 - Metal Rolling Doors #120, 121, 122, 123, 177

Supply one padlock C2883-A for each door with brass chain brandto shell and plate staple on one end of chain for permanent attachment to door frame.

GROUP #22 - Vault Door #142

150

1- Stop 1512 to have auxiliary wood screw and expansion shield.

SECTION NO. 20 - PAINTING

The "General Conditions Governing All Contracts" and the "Specific Requirements" for Contract No. 1 shall apply to all work of this Section.

1. SCOPE

The work under this Section shall consist of furnishing all labor, materials and equipment necessary and required to complete all painting as shown on the Drawings, as herein specified, or as reasonably inferable from the Drawings and Specifications, generally as follows:

- A. Structural steel
- B. Steel windows
- C. Concrete surfaces where scheduled
- D. Plaster surfaces
- E. Asbestos-cement interior partitions
- F. Hollow metal doors and metal frames
- G. All woodwork including doors, exterior and interior.
- H. All other miscellaneous metals
- I. All exposed heating and air conditioning units, ducts, covering and piping.
- J. All exposed plumbing, fire protections and drainage piping, covering and fittings
- K. All exposed electrical P & L conduit boards and boxes
- L. Section signs
- 2. WORK NOT INCLUDED IN THIS SECTION
 - A. Arena insulation on cailing and end walls
 - B. Vault door

- C. Toilet and shower compartments and doors
- D. Shop painting

- E. Non-ferrous metals
- F. Accessories, medicine cabinets and all other items furnished finished

3. MATERIALS

- A. All materials shall be of the manufacture, brand and type as hereinafter specified, or an approved equal, and shall be delivered in the original containers and packages bearing the manufacturer's name and brand with labels intact and seals unbroken, and shall not be opened until after inspection and acceptance by the Architect-Engineer.
- B. All materials shall be ordered sufficiently in advance to be on the job when required and to prevent delays in the work. No claim by the Contractor concerning the unsuitability of any material specified, or his inability to produce first class work with same, will be entertained unless such claims shall be made in writing to the Architect-Engineer before the Contract is signed.
- C. All materials shall be stored where directed by the Architect-Engineer. Oil rags and waste must be removed from the building at the conclusion of each day's work, as they will not under any circumstance be allowed to accumulate.
- D. Ready mixed products shall be used in preference to job mixing, except for white lead and oil paint.
- E. Before delivery of any materials to the site, the Con-intractor shall submit to the architect-Engineer the names of the manufacturers and the name of the article which he proposes to use, where the material list gives a choice. Only such materials which the Contractor proposes to use and only such materials that have been approved as to manufacture, brand, and quality shall be delivered to the site.
- F. Paints shall be well mixed, shall not settle in the container, shall be readily broken up with a paddle to a smooth, uniform paint of good brushing consistency, and shall dry within 18 hours without running, streaking or sagging. Unless otherwise specified, paint shall be mixed at least 72 hours before using, the container shall be covered during this period, and the paint thoroughly stirred again and strained before application.
- G. All work as hereinafter specified, except finished metal surfaces or metal not specified to have a shop coat, shall be painted under this Section. Each coat of paint shall have a variation of color from the preceding coat to allow identification of coats.

4. QUALITY

Quality shall conform to latest edition of Λ STM standard specifications as follows:

- A. White lead shall conform to ASTM D81.
- B. Linseed Gil Raw shall conform to ASTM D234.
- C. Linseed Oil Boiled shall conform to D260.
- D. Putty White lead and whiting to ASTM D317.
- E. Red lead shall conform to ASTM D83.
- F. Turpentine Pure Gum shall conform to ASTM D13.
- G. Shellac white gum in 188 proof grain pure denatured alcohol.
- H. Dryer Japan, Louisville Varnish Company, or approved equal.
- I. Tinting colors for oil paints shall be mineral ground in pure linseed oil of the highest quality obtainable.

5. TYPES OF PAINTS

Ype Ready-Mixed Froducts

- B. Cheeseman-Elliot Company, Brooklyn, N. Y. "Ceco Utility Bakelite Type paint"
- C. Pittsburgh Plate Glass Company's "No. 282T Turpentine Asphaltum"
- D. U.S. Gutta Percha Company "Granolith"
- E. Pratt and Lambert, Inc. #38 Varnishes "
- F. U.S. Gutta Percha Company "Rice's Mill Underccat"
- G. U.S. Gutta Percha Company "Rice's Mill White Gloss"
- H. Detroit Graphite Company "No. 90 Graphite Paint Undercoa"
- J. Detroit Graphite Company "No. 45 Graphite Paint Finish Coat"

Type

Ready-Mixed Products

- *K. Pratt & Lambert, Inc. Ready mixed white lead paints
 Detroit Graphite Co.
 Devoe & Reynolds
 Pittsburgh Plate Glass Co.
 Cheeseman-Elliot Co.
 E.I. Dupont DeNemours & Co.
 - I. Foy Paint Company Enamel Under Coat "Velvatone"
 Pittsburgh Plate Glass Co. Enamel Undercoater 54-97"
 - M. Pratt & Lambert Enamel Finish "Vitralite"
 Pittsburgh Plate Glass Co. Enamel Finish "Waterspar"
 - N. Sherwin Williams Black Paint "Metalastic"

 Pittsburgh Plate Glass Co.- " "Black Ironhide

 E. I. Dupont Co. " "Antoxide Black

 Truscon Laboratories " " "Bar Ox Inhibitive Black"
 - P. Armour Co.'s Glue Size for Masonry "IV Light Amber Glue
 - Q. Benjamin Moore Co. Plaster Primer "Impervo Surfacer"
 Pittsburgh Plate Glass Co. Plaster Primer "Wallhide
 Pirst Coate
- R. Craftex Co. Casein Paint "Sunflex"

 Cheseman Elliot Co. "Ceco Casein Paint"

 S: M. Ewing Fox Co. Hot Water Paint "Muralite"
 - T. Detroit Graphite Co. Primer for Galvanized Surfaces "Cemtex"

 Goheen Corp. Primer for Galvanized Surfaces "Galvanic Primer"
 - U. Technical Coatings, Inc., New York Aluminum Paint "No. 2001 Mixed Aluminum Paint"
 American Asphalt Paint Co. Asphalt Aluminum Paint "Valdura"
 - * Mixed paints as specified above under "K" type shall be a ready mixed paint consisting of white lead or a combination of white lead and zinc white, drying oils, dryer and coloring pigments. Formula for ready mixed paints shall be subject to the approval of the Architect-Engineer.

Walls and ceilings

Walls and ceilings

6. FINISH SCHEDULE

Toilet Rooms No. 1

All Ante-and Powder

to 7, incl.

Rooms

Lo	ocation & Type of Surfaces	Primer	Second	Finish	Remarks
st	ll exposed tructural steel misc. metals	A Shop Coat	В	В	Exterior and interic
	ll steel windows nd frames	A Shop Coat	K Gloss	K Gloss	Exterior and interio
A 3	ll exterior wood- ork and doors	A Shop Coat	K Gloss	K Gloss	Ext. & Int. Sand between coats
A]	ll:interior wood- ork and doors	K Undercoater	K Gloss	K Gloss	Both sides - Sand between coats.
A] fr	ll exterior metal	A Shop Coat	X Gloss	K Gloss	Exterior and interic
	ll interior metal rames and doors				Both sides
	kterior pipe rail- ngs	T T	B Gloss	B Gloss	
ar	oof ventilators nd scuttles .	T	Ħ	J	

Backs of All	Man Caragana			
Interior - Main Plo	QI			and the second s
Asbestos-Cement Partitions	Q Gloss	L	M	Both sides
Concrete columns	Q Gloss	L	Н	Cols. 14S, 15S, 23 22S, 14W, 15W, 21V 22W
Plaster ceiling	Q Flat	K Flat	K Flat	Includes ticket ro
Ceiling and upper walls and entrance lobby	Q Flat	_	K Flat	D 00247

Gloss

Gloss

Gloss

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	,				
)	Location & Type of Surfaces	Primer	Second	Finish	Remarks
	First Aid Room and Closets	Q Gloss	L	M	Walls and ceilings
	Club and Police Rooms	Q	K Semi- gloss	K Semi- gloss	Walls and ceilings
	Slop closets	Q Flat	K Gloss	K Glos s	Walls and ceilings
	All other plastered surfaces	Q Flat	K Flat	K Semi- gloss	Walls and ceilings
	NOTE: Vindows and glazing.	glazed doo	ors shall	receive	second coat before
	Interior				•
	All pipe railings	N Shop Coat	H Gloss	J Glosa	Arena and stairs
ti san taut	Painted base on concrete block partitions	Q Gloss	-	М	6# high above floor
	Section signs	U (**		M Androne Planta	
·	Entrance Lobbies- N/W and S/W	Q Gloss	L	М	Walls and ceilings
	Offices No. 1 to No. 4, incl.	Q	K Semi- gloss	K Semi- gloss	Wall and ceiling plaster.
	-Ticket rooms	Q	K Semi- gloss	K Semi- gloss	Wall and ceiling plaster.
	Toilets Los. 8 to 18, inc. and vestibules	Q Gloss	L	¥	Walls and ceilings
156	Shower and Locker Rooms	Q Gloss	L	М	Walls and ceilings
		•			D 00248

Location & Type of Surfaces	Primer	Second	Finish	<u> Remarks</u>
Team rooms and storage closets	Q . Gloss	K Semi- gloss		Walls and ceilings
Dressing Rooms No. 1 to 7, incl. and closets	Q	K Semi- gloss	Semi-	Wall and ceiling plaster.
First Aid Room and closet	Q Gloss	L	М	Wall and ceiling plaster.
Painted base on concrete block partitions	Q Gloss	~	M	
Slop closet	Q Flat	K Gloss	K Gloss	Walls and ceilings
Vault	Q Flat	K Gloss	K Gloss	Walls and ceiling
Oak wood seats	Fill and Shellac	E	E	

Heating and Air Conditioning

	Units Duci Pipes Fit	ts. Lings	U Francisco	X	X We Not already painted
	Covering - and Fitting	Pipes	P	K	x
	Plumbing. of and fire proping and	rotection	σ	K	K
•	Electric bo		ΰ	K	K

7. The Owner may elect to substitute a resin-base water emulsion paint for oil-base paints specified for interior masonry surfaces. This paint shall be of a formula which will permit overpainting with oil-base paints. The selection of such paint will be subject to the approval of the Architect-Engineer. Such paint may be Moleta Primer and Egg Shell Flat manufactured by Monroe Lederer and Taussig.

8. PREPARATION OF SURFACES FOR PAINTING

- A. If any surfaces are not in proper condition to receive pain or finishing, the Contractor shall notify the Architect-Engineer before proceeding with his work, otherwise the Contractor will be held responsible for any poorly finished work caused by improper base surfaces. The application of a first coat of paint or finish shall be construed as an acceptance by the Contractor of the condition of the base.
- B. Before priming, the Contractor shall thoroughly clean all surfaces of all dirt, oil, grease, rust, scale or other foreign matter. This cleaning shall be done with sandpaper, steel scraper, wire brushes where necessary, or by the use of a suitable solvent.
- C. Concrete, brick and cinder tile walls shall be scraped clean of mortar lumps and projections before any paint is applied.
- D. All plaster and masonry and concrete surfaces to be painted shall first be treated with one coat of a solution of zinc sulphate, mixed 3 to 4 lbs. of zinc sulphate to 1 gallon of water, which shall be allowed to dry on the walls or ceilings and then all loose crystals shall be brushed off.
- E. Galvanized surfaces of pipes, sheet metal work, shall be washed with copper sulphate solution (4 to 6 lbs. of copper sulphate to 1 gallon of water) before the application of any paint.

9. APPLICATION

- A. All work shall be done by skilled mechanics in a work-manlike manner. All materials shall be evenly applied so as to be free from sags, runs, crawls or other defects. All coats shall be of proper consistency and well brushed out to show a minimum of brush marks. All brushes shall be clean and in good condition. No work shall be done under conditions that are unsuitable for the production of good results.
- B. 'All coats shall be thoroughly dry before the succeeding coat is applied, allowing at least 24 hours between coats. Finish surfaces shall be uniform in gloss or flat finish and color. All sash lines and all lines of demarkation between points of different colors or shades shall be carefully drawn so as to be true and free from blurred edges.
- C. Exterior painting shall not be done in extreme cold, frosty, foggy or damn weather. In winter weather exterior painting shall be done only when the temperature is 50° F. or over.

- D. No painting or finishing shall be done in dusty rooms. If required by the Architect-Engineer, the Contractor shall sprinkle floors, etc., to lay dust. Interior painting shall be done only when the temperature is 60° F. or over.
- E. Varnish and enamel undercoats shall be carefully sandpapered with a fine grain paper and shall be dusted before the finishing coats are applied.
- F. Windows or doors shall be open or closed according to weather conditions and as necessary to adequately ventilate all rooms where painting and finishing are being done.
- G. All paint shall be mixed or reduced to proper working consistency only in accordance with the manufacturer's printed instructions, using only materials recommended by the manufacturer.
- 10. SECTION SIGNS shall be according to approved shop details for style and spacing. Painting shall be on concrete and concrete block surfaces. Undercoat of approved aluminum paint shall be exposed outlining black enamel letters and numbers. Basic quantity is as follows:
 - A. 6 signs totaling 90 6-in. high letters and numbers and 6 arrows.
 - B. 68 signs totaling 500 6-in. high letters and numbers.

11. SCAPFOLDING AND EQUIPMENT

The Contractor shall provide all staging, scaffolding, etc. required for the execution of the work, and he shall place same so as not to interfere with the work of other trades and shall move same to permit the installation of other work.

12. PROTECTION

- A. The Contractor shall furnish and lay drop cloths in all areas where painting is being done to adequately protect floors and other work from damage during the progress of the painting work.
- B. Where it becomes necessary to remove temporary protective coverings which have been placed by others in order to execute the painting work, the Contractor shall remove and replace same in a proper manner. If these coverings cannot be replaced, the Contractor shall provide other satisfactory protection. All canopies of light fixtures, all electric switch plates, hardware and similar equipment shall be adequately protected. Sprinkle: heads shall be protected with paper bags or other suitable means.

C. Any damage done to the building fixtures, sprinkler heads, or other equipment through lack of adequate protection by the Contractor, or by accident or carelessness incident to his work, shall be satisfactorily repaired or replaced at the Contractor's expense.

13. COLORS AND SAMPLES

Colors and samples for all finished work shall be as selected by the Architect-Engineer from those submitted.

14. CLEAN-UP

At the completion of the work, the Contractor shall clean off all paint spots, oil and stains from floors, woodwork, glass, hardware, etc., and shall leave the entire building in perfect condition so far as his work is concerned.



SECTION NO. 21 - ENTRANCE MARQUEE

The "General Conditions Governing All Contracts" and the "Specific Requirements" for Contract No. 1 shall apply to all work of this Section.

1. SCOPE

The work under this Section shall consist of furnishing all labor, materials and equipment necessary and required to furnish the entrance marquee as shown on the Drawings, as herein specified, or as reasonably inferable from the Drawings and Specifications, generally as follows:

- A. Steel framing system for marquee.
- B. Aluminum frame and end siding.
- C. Marquee panel box including Bevelite type equipment.
- Sheet metal and felt flashings.
- Suspended lathing and stuccoing of soffit.
- WORK NOT INCLUDED IN THIS SECTION
 - Concrete canopy construction including lightweight concrete fill.
- B. Canopy roofing and flashing.
 - C. Electric supply and service.

3. MATERIALS

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- A. Delivery and Storage
- (1) All materials shall be delivered in unbroken packages plainly marked with the brand and manufacturer's name. Water marked, rusted, or otherwise damaged or deteriorated materials will be subject to prompt rejection and immediate removal from the premises by the Contractor.
- (2) All materials shall be stored in a dry location and protected against physical damage, deterioration, or the intrusion of foreign matter.
 - Shop Drawings

Shop drawings shall be submitted for the approval of the Architect-Engineer showing all conditions of assembly, flashing and caulking and accompanied by samples of materials and fabrication.

C. Quality Requirements

- (1) Structural steel shall conform to ASTM A7, latest edition.
- (2) Sheet steel shall conform to ASTM A245T.
- (3) All steel shall be free from mill scale, loose rust and pitting.
- (4) Red lead 97% shall conform to ASTM D83.
- (5) Linseed oil shall conform to ASTM D234.
- (6) Turpentine shall conform to ASTM D13.
- (7) Galvanizing shall conform to ASTM Al23, and shall be equivalent to Class C hot dipped as specified for Zinc Coated Sheets, FS, capable of withstanding four one minute dips by the standard Presce test.
 - (8) Furring channels shall be 1 in. rolled steel shapes, shop painted.
- (9) Lath shall be 3/8 in. rib expanded galvanized metal sheets weighing not less than 3.4 lbs. per sq. yd.
 - (10) Wire shall be No. 18 USS gage soft annealed galvanized wire.
- (11) Suspended construction shall include all necessary galvanised Chicago or approved equal expansion bolts of adequate size, clips, fastenings and other materials necessary to complete installation.
- (12) Clips to secure furring to 3 in. runner channels shall be 3-strand wire saddle tied or approved equal.
 - (13) Aluminum

- (a) Frame shall be a seamless extruded shape with clips equal to Kawneer 50-307.
- (b) Sheet aluminum shall be at least 16 ga. and of 3-S 1/2 hard alloy and temper unless otherwise approved for the purpose; vertical seam channels and clips shall be furnished for siding. Sheet aluminum shall be alumilited to match finish of extruded frame. Fastenings shall be stainless steel bolts with fiber washers.
- (14) Flashings shall be No. 25 USS ga. monel and asphalt saturated roofing felt, 15 lbs. per square.
- (15) Caulking compound shall be approved aluminum caulking paste and Kuhl's Eastic non-staining compound or other complying with FS-TT-C-598.

(16) Marquee panel shall be a complete unit assembly consisting of a box or housing full length of canopy, as shown, fabricated from No. 12 USS gage sheet steel with welded connections; with a complete Bewelite type panel assembly including vertical support bar assemblies, rows of tracks, stationary and sliding panels, clamping brackets, clip fasteners, Plexiglas panels, and complete set of letters. All screws, bolts, clips, brackets and bars shall have a rust-and corrosion-proof coating equal to or better than the above specified galvanizing. Box panel shall be shop and field painted with zinc chromate or red lead and oil paint. All wiring and lighting equipment required within the assembly shall be included, complete with connection to electric service supplied under Contract No. 4, "Klectrical Power and Lighting."

Complete assembly shall be equal to that of the National Theatre Supply Company, New York and Denver.

4. WORKMANSHIP

A. Structural Steel

- (1) Structural steel framing shall consist of an assembly of frames made up of 2 in. x 2 in. x 1/4 in. and 3 in. x 3 in. x 1/4 in. angles and 3 in. channels, 3'-6" o.c. expansion bolted into concrete canopy slab and 12 in. concrete front wall of building, cross braced as necessary and required; and a complete 3 in. channel sub-frame or buck around marquee panel assembly supported out from canopy edge by means of angle clips bolted to extensions of 3 in. runner channels 3'-6" o.c., and 2 in. x 7 in. bent steel plate separators bolted to buck frame and expansion bolted into fascia of concrete canopy 3'-0" o.c.
- (2) Around entire periphery of 3 in. channel sub-frame or buck at inner flanges 1-1/2 in. x 1-1/2 in. x 1/4 in. x 3 in. long clip angles not over 2'-6" o.c. shall be double bolted. Free flanges of clips and 3 in. x 3 in. vertical hangers flush with fascia of canopy shall be provided with 3/8 in. dia. holes for bolting to marquee bousing box.
- (3) All steel in contact with aluminum shall be painted with zinc a chromate in the field.

B. Marquee Panel Box

- (1) Panel box shall be erected plumb and level and bolted to all 3 in. vertical angles and to fascia of concrete canopy with 5/16 in. dia. galvanized steel expansion bolts and to clip angles on sub-frame with 5/16 in. dia. galvanized steel bolts with separators to allow for reception of aluminum trim flanges, insulation, flashing and caulking.
- (2) Housing shall be provided with means to adequately drain storm water without damage to work of other trades.

C. Frame D 00255

- (1) Aluminum frame shall be assembled in the field in longest practicable lengths complete with mitred corners and closure fittings, and clips for fastening directly to sub-frame and attached clip angles by hooking inner periphery flanges and providing adequate aluminum and stainless steel clip fasteners and stainless steel bolts not over 2'-6" o.c.
- (2) All fasteners and clips shall be insulated from steel by layers of roofing felt and zinc chromate paint.

- (3) Stainless steel or monel metal clips shall be fastened on not over 30 in. centers and built-in with frame for fastening metal flashings along top of frame, entire length and along inner periphery of frame entire length of bottom or sill and both jambs, and entire length along bottom where aluminum trim meets galvanized screed at stucco.
 - (4) Caulk all joints thoroughly with aluminum caulking paste.

D. Siding

- (1) Aluminum siding at ends of marquee shall be made up in three panels of sheet aluminum with seams backed by vertical channels, lower ends of which shall drain outside of flashing.
- (2) Sheet shall be bent back and clip-locked into heoked flanges of channels. Channels shall be bolted with stainless steel bolts to hanger angles.
 - (3) Caulk all joints thoroughly with specified caulking paste.

R. Stucco Soffit

- (1) Furring angles shall be spaced 16 in. o.c. and secured to runner channels with wire.
- (2) Metal lath shall be tied to furring with No. 18 ga. annealed galvanized wire not over 6 in. apart. Ends and sides shall be lapped not less than 1 in. and securely laced with No. 18 ga. galvanized wire to each furring member and at intervals of not less than 6 in.
- (3) All furring and lathing shall be level, true and rigid, and in general 3/4 in back of the finish line.
- (4) Galvanized screeds of approved section shall be placed along all four sides of soffit panel.
- (5) Cement stucce shall consist of three coats composed of one part approved Portland cement, two parts lime putty and nine parts sand by volume. Scratch or first coat shall contain 7-1/2 pounds of approved fiber per cu, yd. of sand. Submit sample of finish for approval of Architect-Engineer.

7. Plashing

D 00256

- (1) Insulation consisting of roofing felt strips shall be installed wherever aluminum contacts steel and under all metal flashing.
- (2) Roof flashing shall be monel metal extending from reglet along top of canopy curb to drip edge beyond aluminum trim. Deck shall be laid with standing seams not ever 21-6" o.c. spanning from reglet to edge; and with long edges folded in locked seam at reglet and around clips forming drip along outer edge. Deck flashing shall be mitred with cap flashing at ends of canopy.
- (3) Flashing along bottom edges of marquee between aluminum frame and stucco soffit shall terminate in a roll drip edge mitred at corners.

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6. Marquee Panels

- (I) Marquee panel assembly shall be erected in accordance with manufacturer's specifications and shall be complete and thorough.
- (2) Plexiglas panels shall be straight and true. Scratched or otherwise damaged panels shall be replaced at the Contractor's expense.
 - (3) Entire panel assembly shall be made weatherproof.

H. Caulking

All joints around panel, at flashing, at entrance door transom frames, and wherever else necessary shall be adequately caulked with elastic caulking compound.

L Cleaning

- (1) All glass and metal surfaces shall be thoroughly cleaned and polished.
- (2) The Contractor shall remove all scaffolding, protection and debris upon completion of his work.

SECTION NO. 22 - ALTERNATE NO. 2 - REMOVABLE BARRIERS

The "General Conditions Governing All Contracts" and the "Specific Requirements" for Contract No. 1 shall apply to all work of this Section.

1. SCOPE

The work under this Section shall consist of furnishing all labor, materials and equipment necessary and required to complete all removable barriers as shown on the Drawings, as herein specified, or as reasonably inferable from the Drawings and Specifications, generally as follows:

- A. Built-up wood partition sections 48 in. x 96 in. nominal.
- B. Pipe stanchions and fittings.
- C. Upper adjustable pipe railing extension.
- D. Shop and field painting.
- 2. WORK NOT INCLUDED IN THIS SECTION
 - A. Floor sockets including flanges, sleeves and covers.

D 00258

3 MATERIALS

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A. Lumber

- (1) All lumber shall comply with the American Lumber Simplified Practice Recommendation R16, unless otherwise noted or approved. Lumber shall bear the official grade mark of the association under whose rules it is graded and moisture content shall conform to the requirements of said rules.
- (2) All lumber and millwork in transit or wherever stored shall be protected against damage or change of moisture content from the label specification.
- (3) Framing lumber shall be No. 1 structural long leaf yellow pine, dense No. 1 structural short leaf southern yellow pine, common structural larch or Douglas fir, or other structural wood having minimum working strengths of 1200 p.s.i. in bending and 90 p.s.i. in horizontal shear, and shall be S4S.
- (4) Caps shall be C select or better pine as graded under the rules of the Western Pine Association.
- (5) Plywood panels shall be commercial Douglas fir concrete form grade moisture resistant plywood not less than 5 ply and 3/4 in. thick.

B. Metals

- (1) Wrought iron shall comply with ASTM A41, and shall be made wholly from puddled or processed iron free from any admixture of steel.
- (2) Pipe shall be black steel pipe, standard weight for adjustable railings and extra heavy for barrier stanchions, free from mill scale and pitting and shall be clean.
- (3) Fittings shall be steel with welded or bolted connections as shown on Drawings.
 - (4) Straps shall be wrought iron with countersunk stove bolts.

4. FABRICATION

A. Barrier System

- (1) Each section of the interchangeable-unit barrier system shall be a 2 in. x 4 in. frame consisting of headrail, sill and five stude sandwiched between two sheets of 3/4 in. plywood.
- (2) Rails shall be and nailed to stude; all but four outer corners shall be fitted with solid corner blocks screwed to end stude and rails.
- (3) Plywood panels shall be glued and face nailed to frames. Glue shall be moisture resistant and nails shall be not over 6 in. o.c.
- (4) Cap piece shall be mailed to head rail on not over 6 in. centers, both sides, staggered.
- to fit around stanchions, two straps at each end or four per unit. End of straps shall be countersunk flush with edges of end stude and each end shall be double bolted with countersunk stove bolts.
- (6) Pipe stanchions shall be provided for insertion in floor sockets installed 8'-0-1/2" o.c. under Section 12, "Miscellaneous Metals." Stanchions shall be extra heavy black steel pipe one size smaller than brass sleeves of floor sockets to provide close fit. Each stanchion shall be 60 in. long with steel flanged collar of same diameter opening, welded to top with 3/8 in. Ø bolt holes through collar for adjustment bolt connection to sleeved extension stanchions.

B. Adjustable Pipe Railing

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(1) Railing shall consist of extension stanchion to main stanchions specified above, one size smaller in size to provide a close fit.

- (2) At top of each extension stanchion provide a steel channel section with flanges up, 2-1/4 in. x 3 in. x 1/4 in. x 6-1/2 in. long, pierced by and continuously welded to stanchion. Through webs of channels provide plain holes to receive 1/4 in. bolts used to fasten rails to stanchions.
- (3) At two 15 in. intervals down from top channel connection described above provide two more such channel fittings.
- (4) Provide two complete lines of pipe railings in proper lengths and with slotted holes for bolting to channel fittings.
- 5. PAINTING (See Section No. 20 "Painting" for Paint Types)
- A. Wood units shall be painted one coat of type K paint before leaving shop and two coats in the field sanding between coats.
- B. All iron and steel pipe and fittings shall be painted one coat of rust inhibitive type N paint before leaving shop and a coat each of types H & J in the field. Color and paint type shall match similar finish on other pipe railings in Contract No. 1

6. CLEANING

All surfaces of complete barrier assembly and all adjoining surfaces of other work affected by this operation shall be thoroughly cleaned prior to acceptance. All debris caused by this operation shall be removed from the premises.

SECTION NO. 23 - CAULKING

The "General Conditions Governing All Contracts" and the "Specific Requirements" for Contract No. 1 shall apply to all work of this Section.

1. SCOPE

The work under this Section shall consist of furnishing all labor, materials and equipment necessary and required to complete all caulking as shown on the Drawings, as herein specified, or as reesonably inferable from the Drawings and Specifications, generally as follows:

- A. Caulking of all exterior windows and door frames.
- B. Caulking of roofing reglets.
- C. Caulking of door saddles, etc.
- D. Caulking at expansion joints in concrete walls.
- 2. WORK NOT INCLUDED IN THIS SECTION
 - A. Expansion joints in concrete floors.

MATERIALS

A. General

All caulking materials shall be delivered in the manufacturer's original containers with umbroken seals.

B. Caulking Compound

- (1) Caulking compound shall be Kuhl's "Elastic" non-staining caulking compound or other approved caulking compound complying with Fed. Spec. TT-C-598.
- (2) Caulking compound shall be an elastic waterproof material that will not harden, crack or flow between temperatures of 10°F. below, or 150°F. above zero. It shall be light gray in color, of gum consistency, and shall be delivered in manufacturer's labelled containers.

C. Primer

Primer shall be a liquid caulking primer as manufactured or approved by the manufacturer of the caulking compound.

4. WORKMANSHIP

A. Preparatory Work

- (1) The Contractor shall examine all joints before proceeding with this work and shall either clean out any joints not in proper condition to receive the caulking, or should the joint be improperly formed, he shall notify the parties responsible for the faulty work to be caulked to correct the condition.
- (2) All joints to receive caulking compound shall be thoroughly cleaned of mortar or other material to a depth of 3/4 in.
- (3) Surfaces of joints, except metal, shall be primed with liquid caulking primer applied with a brush.
- (4) Where removable staff beads occur at exterior door frames, caulking shall installed prior to application of same.
- (5) Caulking compound shall be applied with a gun which shall develop sufficient pressure to completely fill the joints. Gun nozzle shall be of proper size to fit the joints.
- (6) Except as otherwise detailed, or as design of construction may permit, depth of caulking compound shall be not less than 3/4 in., and joints shall be filled to greater depth, where required.
- (7) All joints wider than 1/4 in. shall be caulked with hand picked cakum or jute to within 1/2 in. of the surface and filled with caulking compound. All joints 1/4 in. wide or less shall be completely filled with caulking paste.

B. Metal Door Saddles or Sills

A bed of compound shall be spread over entire seat of saddles or sills and saddles and sills set on same. All excess material shall be removed and joints neatly pointed.

C. Joints

- (1) Finish of caulking joints on flush surfaces shall be neatly pointed with heading tool and excess material removed.
- (2) Finish of caulking joints in internal corner shall be neetly pointed with a coving tool and all excess materials removed.
- (3) Adjacent materials which have been soiled shall be cleaned immediately and all work left in a neat, clean condition.

5. GUARANTEE

- A. The Contractor shall guarantee that the caulking materials will not cause staining of any of the work with which it is in contact, that it will remain elastic and adhesive without sagging, and that the installation will prevent infiltration of air or water at joints where caulking is placed for a period of five years from date of completion. The Contractor shall repair or replace at his own expense any or all caulking which leaks or becomes otherwise defective within that period.
 - B. The following types of failure shall be adjudged defective work:

 Leakage, hardening, excessive cracking, crumbling, melting,
 shrinkage or running of caulking compound, or staining of

adjacent work by caulking compound.



CONTRACT NO. 2 4 HEATING, VENTILATING & AIR CONDITIONING

SECTION NO. 1 - SPECIFIC REQUIREMENTS

1. APPLICABILITY OF CONTRACT DOCUMENTS

The Contract Documents shall be those defined as such in the Agreement. The "General Conditions Governing All Contracts" shall apply to all work of this Contract.

2. SCOPE

It is the intention of these Specifications and the accompanying plans to include all labor and materials to install completely and leave in full and proper working order to the complete satisfaction of the City and County of Denver the following systems as shown on Drawings and herein called for:

- A. Arena Heating & Ventilating system complete with gas fired industrial heaters supply and exhaust fans, by-pass, ductwork, diffusers, incidental pipework, dampers, intake louvres, automatic controls etc:-
- Bo Arena Air Conditioning fame and ductwork, with cooling coils, well water supply piping, discharge connections to leader drains, drip pans, automatic controls etc:-
- C. Promenade, Basement and Entrance etc: steam heating system complete with boiler plant and cil burning equipment, steam and cendensate pipe work and miscellaneous connections with valves traps specialties condensate pump, unit and entrance heaters, radiation, ice melting coils, etc: etc:
- Do Basement Heating & Ventilating System including, supply and exhaust fans, ductwork, grilles registers and diffusers, louvres, filters, heater, automatic controls etc:
- E. Toilet and Dressing Boom exhaust ventilation system including fans, dustwork registers, controls etc:-
- F. Refrigeration Boom supply and exhaust ventilation system including supply and exhaust fans, supports, ductwork, louvres, heater, filters, registers, controls etc:-
- G. Promenade exhaust ventilation fans complete with all accessories controls etc:-
- Ho This Contractor shall be responsible for the entire work and shall Felate all systems to make a complete installation.

3. WORK NOT INCLUDED

- A. General painting of equipment furnished under this contract shall be done by others.
- B. All electric wiring will be done by others. The heating Contractor shall only furnish and set controllers and motors, and he shall furnish to the Electrical Contractor all necessary wiring diagrams for the connection of his apparatus.
- C. Plumbing connections shall be provided by the Plumbing Contractor. All other plumbing work shall also be carried out by the Plumbing Contractor.

4. STANDARD DEFINITIONS

As used hereinafter the following abbreviations shall apply.

A.S.H.V.K. - American Society of Heating & Ventilating Engineers.

A.S.M.Z. - American Society of Mechanical Engineers

A.S.T.M. - American Society for Testing Material

5. SPECIAL CONDITIONS

A. It is the intention of these Specifications and the Drawings to call for finished work, ready for operation and therefore any apparatus appliance or material not shown on Drawings but which is mentioned in the Specifications or vice versa or anything which may be necessary to make the work complete and perfect in all respects and ready for operation, even if not particularly specified, shall be furnished delivered and installed by the Contractor the same as though specifically shown on Drawings or mentioned in the Specifications without any additional expense to the City and County of Denver.

Bo All materials and apparatus required for this work shall be new and shall be furnished, delivered, erected, connected and finished in every detail and the entire plant is to be tested, left complete and in perfect working order. All labor to be performed shall be carried out in a thorough and workmenlike manner by skilled labor. All materials shall be delivered and erected in place with sufficient rapidity so that the work may be performed to complete the installations at the time set fourth as the date of completion.

Co. All piping shows on plans is diagramatic. Consult the ArchitectEngineers detail Drawings and constructional Drawings for actual spaces available
and for building and sciling details before installing pipes and apparatus. This
Contractor shall cover such additional deviations from the plans as may become
necessary to meet the actual structural conditions and to accommodate apparatus
installed by other parties, also minor alterations of work already installed to
suit decoration and trim, any discrepancies in estimate measurements made from
plans, and any extra services, labor and materials not mentioned herein that may
be necessary to company with all laws and regulations of all departments having
juriediction over this work.

- D. This Contractor shall furnish all necessary templates, patterns, for installing his work and for the purpose of making adjoining work conform. Also any dimensioned detailed sketches showing the size and construction of his apparatus and material as may be required by the Architect-Engineers. This Contractor shall inform himself fully regarding peculiarities and limitations of space available for the installation of all his apparatus.
- E. This Contractor shall be responsible for the perfect operation of the entire work in this Contract and shall make good and repair without expense to the City and County of Danver any part of the work which is imperfect or which may become clogged or inoperative due to lack of protection during construction, to defective material or to poor workmanship. This Contractor shall see that all of his equipment such as dampers, regulators, valves, traps, dirt, pockets, regulating tees, etc., which it may be necessary to reach at intervals for operation and maintenance purposes shall be fixed in fully accessible positions.
- F. This Contractor is to protect and insure his wwn materials being responsible in every respect for all parts of the plans, whether paid for or not, until his work is completed, the apparatus accepted and left in charge of the City and County of Denver. Breat all sheds for storage of materials and provide temporary office for plans, details, records etc:-
- G. This Contractor shall furnish the services of an experienced Superintendent who shall constantly be in charge of the installation of the heating and associated work together with all necessary skilled workmen, helpers, fitters, welders and labor required to properly unload, transfer, erect and connect up, edjust, start, operate and test the systems.
- H. Where no specific kind or quantity of material is given, a first class standard article as approved by the Architect-Angineers will be furnished.
- I. This Contractor shall furnish all scaffolding and equipment required for the installation of his work.
- J. Small details not usually shown or specified, but necessary for the proper installation and finishing shall be included in the Contractor's estimate, the same as if herein specified or shown.

6. CODE RULES AND PERMITS

- As all work and materials shall be installed in full accordance with all laws and regulations having jurisdiction and this Contractor shall secure all necessary permits, pay all fees etc; to this end.
- B. This Contractor shall include in his work, without extra cost to the City and County of Denver, any additional materials or apparatus required but not shown on the Drawings or specified, to meet the laws and regulations.

7. DETAIL DRAWING

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A. This Contractor shall furnish setting plans and shop details for all branches of the work as required. Where said Drawings are approved by

the Architect-Engineers, said approval does not mean that said drawings have been checked in detail and said approval does not in any way relieve the Contractor from the responsibility nor necessity of furnishing material or performing work required by the contract Drawings and S pecifications.

- B. This Contractor shall furnish for approval detail dimensioned Drawings showing the construction, size, arrangements, etc., all apparatus, specialties, etc. which he proposes to furnish and such other detail information concerning which the Architect-Engineers may desire detailed information or which may be required for the building construction. Number of copies of Drawings submitted to be as required.
- C. This Contractor shall submit a list of materials giving manufacture and figured numbers for the approval of the Architect-Engineers. This Contractors desired to use materials of manufacture given hereinafter does not relieve him of submitting a list.

8 EXCAVATION

- A. Mass excavation to approximate building levels will be carried out by others. This Contractor shall however do all trench and pit excavation and back filling work required for his work inside and outside the building including repairing of finished surfaces as required.
- B. In this connection the Contractor shall make all arrangements with the City and County of Denver, file all applications, obtain all permits and pay all fees.etc.:- and generally carry out the works to City and County requirements.

9. CUITING & PATCHING

- and trenches in walls and floors for this Heating Contractor, who is to determine the size and location as desired, and if this Contractor does not supply the proper information to the General Contractor, he is to pay for making the necessary changes or corrections.
- B. This Contractor is to Turnish to the General Contractor the necessary sleeves which are to be built in masonry walls. The exact height and location of these sleeves are to be determined by the Heating Contractor.
- C. If, after the General Contractor has made any openings at the request of the Heating Contractor, the Heating Contractor decides to change the locations of such openings, he shall pay the General Contractor for doing the additional work.
- D. All holes out through concrete arches shall be punched or drilled from the underside.

10. POURDATIONS & PIES

All foundations and piers required for the installation or support of apparatus furnished under this Contract shall be furnished by this Contractor. He shall furnish necessary foundations or supports underweath fans, heaters, pumps, and similar apparatus.

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- As This Contractor is to test all materials, apparatus, specialties, etc; furnished or installed under this contract to see that they operate properly and quietly and that they are free from defects. He is to test all motors and controls and leave them in matisfactory working conditions
- B. Low pressure steam piping shall be tested under full city water pressure and all lines specialties etc: shall be left in a drip tight condition. Any pipes or connections which may be found to be imperfect are to be taken apart and remade as no caulking will be permitted. After the entire system is completed, Contractor is to make steam test on all work, is to see that all apparatus and specialties are properly adjusted and working in a proper manner.
- Go Lines are to be installed in a proper manner, with proper pitch, etc., a so that circulation is obtained without water hammer or other noise. If noise develops, Contractor is to remedy the condition.
- D. This Contractor shall carry out all boiler and steam tests as required by the City and County of Denver or any Local Anthorities or Insurance Underwriters.
- E. This Contractor shall test and adjust completely and leave in full working order all the various Ventilating, Air-Conditioning systems throughout the building. Include taking air readings at all supply and exhaust openings, testing all fans etc: to give proper air distribution of air mounts as given on plans. Furnish triplicate copies of all final air readings to the Architect Sociaers.
 - Y. This Contractor shall furnish all necessary skilled labor for operating the entire plant as required for making tests and adjustments, also all fuel.
 - Go Contractor shall furnish the necessary skilled labor for operating the entire plant for a period of ten (10) days, of eight hours each, after completion, and during this period he shall instruct the City and County of Denver Engineer in regard to all details as to the operation and adjustment of the equipment and specialties.

12. TEMPORARY HEAT

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- A. In order to dry out the building during the course of construction the Contractor shall make provision for temporary heating arrangements for those sections requiring such heat.
- Bo This work shall be done in conjunction with the General Contractors, so that agreement is reached on the various sections which will require drying

out during the progress of the building construction and arrangements can be made to apply such temporary heat as and when it is required.

- C. For the purpose of such temporary heat, the permanent equipment as specified herein shall be used. This Contractor shall therefore schedule the progress of his work accordingly so as to have available sections of the installation ready for such use as may be required. Such heat shall not be provided for cold weather concreting operations.
- D. Furnish the services of a skilled mechanic to operate the system during temporary heating period. Such service shall be on an hourly basis and the Contractor shall quote a separate hourly rate to his main Contract price this service.
 - R. Fuel for such temporary heat shall be furnished by this Contractor.

13. GUARANTKE

- A. This Contractor shall guarantee to, at his own expense, replace or repair promptly any workmanship or materials in which defects may develop within one (1) year from date of final acceptance of his work.
- Bo Where such defects occur, this contractor shall be held responsible for all costs incurred in making the defective work good and all injuries to plaster, wood or other finish caused by such replacements and repairs of defective work shall be replaced and repaired in first class condition by this Contractor at his own expense.
- Q. This Contractor shall furnish certificates of guarantee from the manufacturer of specialties furnished under this contract to the effect that they will furnish new parts or apparatus where defects occur due to faulty manufacture, for a period of one year from date of final acceptance.

14. RECORD DRAWING

- A. This Contractor shall keep a complete and accurate record of all deviations in the location of all pipes, pipe sizes, etc., from the Contract Drawings, as well as all pipes laid under floors or not shown on the Drawings and shall on the completion of the work, furnish one set of unit on cloth tracings shewing the exact location of all pipes control valves, specialties.
- Bo In the preparation of these tracings, the Contractor may make use of lithograph prints of the Architect-Engineers Contract Drawings if he so desires. He shall however provide such lithograph prints at his own expense.
- Ca. Also prepare framed charts to be located as required giving small detail plans of heating steam distributing, cooling water, ventilating and air conditioning systems, showing controls for the same. Three copies of each chart to be provided.

15. COST OF TEMPORARY SERVICES

This Contractor shall include his proportionate share of the expense for .: water, electricity, heat, telephone and disposal of rubbish etc: water used during the entire period of his Contract as may be agreed upon between the Contractor for Contract No. 1 and this Contractor.

SECTION NO. 2 - MATERIALS

l. PIPE

- A. Steel pipe shall be new black stendard weight steel pipe as made by Mational Tube Co., Youngstown Sheet & Tube Co., Bethlahem Steel Co., or equal. Use proper weights for services carried. Wrought iron pipe shall be genuine wrought iron as manufactured by A. M. Byers Co., or equal approved of standard weights and sizes. To be double hot dipped galvanized where specified.
- B. Copper pipe shall be type "L" soft temper intermediate gauge as manufactured by Chase Brass & Sopper Co., or equal.
- 6. Cast iron pipe shall be sound smooth gray iron, free from cracks and holes and other defects. To be of extra heavy grade as manufactured by Alabama Pipe Co., Central Foundry Co., Essex Foundry, or equal. Pipe to be marked with makers trade name and weight of pipe.
- D. Pipe is to be straight, true and round and all pipe and connections are to have the ends resmed and the burns carefully removed.
 - R. No short pipe is to be used where full lengths can be installed.
- F. Where pipes are to be welded, the pipe is to be delivered mill beveled.

2. FITTINGS & FLANGES

As All fittings for steel and prought iron pipe shall be east or malleable iron steem pattern with heavy beeds, standard weight with clean undamaged screw threads tapped to a gauge and true, as manufactured by an approved major specialties manufacturer. There pipe runs diminish in size or branches are taken off, use reducing fittings. Where distributing mains reduce in size, use eccentric reducers. No bushings will be permitted. Furnish all necessary fittings for making up piping and specialties and for the purpose of step-ups or step-down or taking care of expansion, furnish and install all necessary flanges with bolts and joints for making up piping and specialties where required.

shall be

Bo All fittings for copper sweet solder type [95/5]/as manufactured by Chase Brass & Copper Co., or equal.

C. For galvanized wrought iron went lines use galvanized malleable iron fittings.

D. All fittings for cast iron pipe shall be east iron flanged extra heavy type.

TYPES OF PIPE & FITTINGS

For services as indicated use pipe and fittings as below:-

Steam Lines

Standard weight black steel pipe and extra heavy cast or malleable fittings

Condensate Lines

Black wrought iron pipe with extra

heavy cast iron fittings.

Vent Lines

Galvanized wrought iron pips with cast iron drainage fittings.

Age tion distant that

Cooling Water Lines

Flanged Cast Iron pipe and extra heavy flanged cast iron fittings.

4. JOINTS

A. All sorewed joints shall be made up iron to iron with lead and oil used as a lubricator. No special compound will be permitted for the purpose of making these joints tight. All flanged joints, flanged valves, etc., are to be furnished with an approved type of reinforced rubber gasket. Adjustable dies must be used on pipework in connection with such joints and all sixes must be clean cut, two threads through the die and offre must be taken to remove all inside burrs with a reamer. All pipe 2 and less in diameter must be cut with a hackseve.

B. Gomections between wrought iron pipe and east iron pipe shall be comiked, joints made as herein described for east iron pipe. The end of the wrought iron pipe shall be fitted with a ring or part of a compling screwed on to form a spigot. Connections between lead and wrought iron pipe shall be made with brass soldering mipples, of the same size as the iron or steel pipe, and the lead pipe shall be attached by meens of a wiped joint.

9. All welding shall be done by men skilled in this particular line of work. For bends, 900 turns, etc., where full size bends cannot be used, use Tube-Turns, or bends of similar and equal make. All welded joints shall be made by the oxyscotaylane process. All pipe 2" or over may be welded and may be purchased mill bevaled, or shall be machine bevaled on both ends before being welded.

B. On odd lengths of steel pipe, beveling may be accomplished by the use of the fixyacetyline cutting torch, provided all scale and exide are removed with a hammer and chisel or file. For odd lengths or brass pipe, a file or other suitable tool may be used to secure the required hevel.

The width and reinforcement of walded joints shall be as approved. The wilded metal shall be thoroughly fused with the base metal at all sections of the weld, and the penetration of the weld shall include the unbeveled portion and extend to inside walls of the pipe. All scale, rust, firt, or other foreign matter, shall be thoroughly removed from the ends of the pipe lengths before tacking and welding. The pipe lengths shall be lined up straight, and the abutting pipe ends shall be concentric. The spacing and tack welding shall be such as to prevent the pipe from lapping or getting out of alignment during the welding operation. All welds shall be made in a first-class workmanlike manner. For steel pipe welds, high test welding rod, equal to Oxweld No. 1-A, or its approved equivalent, shall be used. For brass pipe welds, Oxweld No. 10 welding rod and Brazo Time, or their equivalent, shall be used. Use one-piece welded flanges, caps, elbows, branch outlets, tees, etc., of Tube-Turn, Taylor Forge, Grinnell, or equal approved.

5. HANGERS & BRACKETS

A. This Contractor shall furnish and set all required pipe hangers for the proper support of all piping installed by him. All hangers for horizontal piping shall be provided with beam clamps or inserts in concrete or 4" x 4" plates with nuts where hangers pass through floor or ceiling or as otherwise approved. Hangers are to be malleable iron aplit hangers. GlipeBar -Grimmell - Grabler or equal as approved. There several lines of piping are run in a common location, they are to be supported by adjustable hangers with a common bar or pipe. All pipe shall be properly anchored and braced as may necessary. This Contractor shall farmish and install all such necessary anchors and bracings. All hangers shall be put up straight and true and in perfect alignment and no hanger shall be placed near couplings. Hangers for pipes 12" and smaller to be spaced approximately 7 ft. on centers. For pipes 2" and over, the hangers are to be spaced approximately 15 ft. on camters. On all main lines 12" and smaller where there is a 90 or 45 degree bend, a hanger shall be placed approximately 11. away from this bend on either side. Turnish and install all required floor standars with bracket plates and wall clips and other required steel work for the support of the various materials and apparatus furnished under this Contract.

B. In the Basement area all pipe hangers are to be apaced at approximately half the spacings above specified, and are to be rigidly held to prevent any awing of the pipes.

6. SLEEVES & PLATES

Furnish and install pipe sleeves for all steam and condensate lines passing through floors, walls, partitions, foundations. Sleeves through masonry walls are to be regular iron pipe. Sleeves through floors, thin partitions, furring, etc., shall be #20 gauge galvanized iron. At all entrance or exit locations of pipe lines, furnish and set approved type of escutcheon plate.

7. VALVES & TAGS

A. This Contractor shall equip each valve with the proper size brass tag secured to the valve wheal by brass links. This tag, is to be numbered or

lettered, and the Contractor shall prepare a triplicate schedule tabulating valve numbers and designating the line or apparatus controlled by the valve. One of these schedules shall be framed under glass and placed as directed by the City and County of Denver.

B. Furnish and install all control and isolating valves as called for in this Specification or shown on the accompanying plans. Also, furnish and install such other necessary detail valves not shown but necessary for proper operation. All control valves are to be for 125# steam working pressure and are to be of standard design. Valves are to be new, of first quality and finish and are to be left fully packed. To be bronze composition with bronze or brass mountings. Ill valves unless otherwise called for are to be gate VELVOS.

8. TRAPS

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The Contractor shall furnish and install all low pressure traps required for entire installation. Traps shall be combination float and thermostatic traps of the Sareo or Webster make. This Contractor shall so install his piping and apparatus that the steam circulation will be free from water hammer, and should water hammer occur, Contenctor shall make such changes as may be necessary to eliminate this noise. Provide all traps and drip valves with a strainer and shut-off valve shead of the strainer, and shut-off beyond drip valve.

9. EXPANSION JOINTS & ANCHORS

In connection with the steam distributing lines as shown, this Contractor shall furnish and install Badger, or equal approved, self-equalizing expansion joints, having corrugations to take care of not less than 2" of expansion, and furnished with anchors and pipe guides, or he shall furnish expansion loops where space conditions permit. Provide all proper anchorage for steem meins in conjunction with these expension joints as indicated.

10. PRESSURE CAUGES & THERMOMETERS

- A. Furnish steam and water pressure gauges as required on all systems.
- B. Provide 4" diameter steam gauges at supply connections of all steam air heaters, brine heater, hot water service heater.
- G. Provide 6" diameter water pressure gauges on discharge connection of each wall pump.
- · B. Provide S" seale air thermometers on discharge of each Arena Heating Unit, and on snotion of each Arean Ventilating fan. Also at discharge of each Arena Summer Air Conditioning fan. Also on inlet and discharge of Basement Ventilating planto
- Lo Graduation of each device to suit operating conditions. Provide symbons and cooks for steam gauges and cooks for all other gauges. All devices to be placed in locations suitable for easy reading and to be of types equal to those manufactured by Crosby, Ashton, Taylor Etc :- Thermometers to be of room or duct mounting type as required.

F. Provide differential draft gauges between suction and discharge duct connection of basement supply fan across the filters.

11. CONDENSATION SPECIALITIES

- A. Steam circulation for the heating system shall be accomplished by means of a low pressure gravity open return system and the Contractor shall furnish and install valves and traps on the return end of the units of radiation, heater, vent locations, and all drip points. Furnish and set all F.& T traps. and thermostatic valves, strainers, etc., as required to obtain a circulation of steam throughout the entire system whereby the air and water of condensation will be removed from the various heating units and provide a complete and positive circulation of steam throughout the entire system. The Contractor shall so install his piping and apparatus that the circulation will be free from water hammer and should water hammer occur, the Contractor shall make such changes as may be necessary to aliminate this noise. Provide all drip valves with a strainer and shut-off valve shead of the strainer and shut-off beyond the drip valve.
- B. Provide drip valves at the base of each riser. F. and T., and thermostatic traps shall be capable of draining the radiation of all air and condensation and at the same time prevent the escape of steam into the return piping system. These shall be the latest and most approved type, and shall be installed in accordance with the manufacturer's direction. Radiator return valve shall be N.P. body with polished N.P. trimmings and shall be furnished with union connections. Valves of the Barnes & Jones, Illinois, Sarco or equal approved make will be accepted. All drip traps shall be of the K-master make provided with valves and test connection and strainers on inlet side.

12. SHERT METAL WORK

An This Contractor shall furnish and install all sheet iron work in commection with the heating and ventilating systems all as shown and herein called for. This work includes horizontal and vertical ducts, cross-wers, adjusting dampers, deflectors, connections to units, fan connections, louvres, fan setting, furnishing and setting, of grilles, registers and diffusers, etc.

Bo This Contractor shall see that the proper size openings are left in the building construction for the installation of all horizontal and vertical ducts, for the setting of all registers, grilles, etc. Contractor is to lay out his work at the building, taking all necessary measurements and constructing his work to meet the building conditions.

C. Duet Work, unless marked of a heavier gauge on the plans, shall be of thickness not less than the following:

		Wal wani zec			Steel		Aluminum	
Ducts	up to and including 12"		26	gauge	gal.		.25 "-22B&S	gauge
×	over 12" and up to 24"	••••	24	*	Ħ		# #	Ħ
Ħ	24" and up to 60"		22	•	11		.032 -20	*
. #	over 60" and upt to 90"	• • • •	20	Ħ	10	•••••	·040 -18	W
•	91 and up	• • • •	18	*	*	0	.051 -16	W

- D. Restrondent alestes above dimensions must be properly ribbed so that no vibration will occur. Sheets of all duess to be braked or bent both ways to stiffen the sheets. On larger sizes/external stiffenting by flat bar rather than angle iron shall be used.
- E. All surves er delives shall be of as long turn as the building construction and location of the ducts will permit, and where changes in the shape of ducts are to be made, the full areas are to be retained.
- Fo All horizontal duess shall be supported with he adjustable wrought iron pipe hangers, or equal, spaced approximately 8 feet apart, and supported from the calling slabs, or floor becaus. All vertical duess shall be furnished with bolted or riveted wrought iron concealed hangers at each floor level.
- We made main branch of the dust systems shall be furnished with the necessary adjustable deflector or damper, in order that the eact may be properly regulated to give the air supply desired. There dampers or deflectors are in exposed or accessible positions, they shall be furnished with a damper locking and regulating device.
- H. The Contractor shall install all air control, or hir shut-off dampers. Turnished by the temperature control sub-contractor, and in connections with these dampers, this Contractor shall install an access door furnished with brass hinges, and fasteners, and to be so constructed that the access doors will be air tight.
- I. The Contractor shell furnish and sompletely install the heater easings and all sheet netal work in connection with all supply units. These easings shall be securely bolted, and riveted together and shall be furnished with the necessary stiffening angles and cross bracing. Provide access doors in manual stiffening angles and cross bracing. Provide access doors in manual stiffening angles and cross bracing. Provide access doors furnished with triple brass hinges, and triple fasteners, reinforcing the door openings with angles and constructing the doors in an air-tight manner. Provide openings through this sheet metal work for pipe connections, neatly punching the openings.
- Jalvanised
 Ja Furnish and install all pecessary feeter intake and exhaust louvres
 where required of sizes indicated on the plans, and as specified hereinefter.

15. BRIP PARS

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Furnish and install undersal cooling soils and elsewhere where indicated an Drawings watertight 2" high arip pans of 22 oz. copper. Provide drain connection to each to suit Plumbing Contractors drain to sizes shown.

14. RECISTERS, CHILLES & DIFFUSIONS

- A. This Contractor shall furnish and install all supply and exhaust diffusers and registers for all air amply and all air exhaust openings.
- Bo The seiling supply outlets in general shall be of the seiling diffuser type similar and equal to the Anemostat, with adjustable neck dampers and are

to be constructed of aluminum. Supply grilles where indicated shall be of adjustable ber type as manufactured by Tuttle & Bailey, Waterloo Register or equal approved, of areas and sizes shown. When the construction of areas and sizes shown. The construction of the c

- C. For the various exhaust openings furnish stamped steel grilles, #10 gauge steel except as indicated of areas and sizes shown. All steel grilles or register faces and ceiling diffusers shall be finished flat prime painted. Finishing painting to be done by others. Where registers or grilles are attached to duct work, they shall be furnished with necessary angle iron frame and shall be connected in an air-tight manner to the ducts.
- D. All supply and exhaust openings shall be furnished with volume dampers in their branches. Where connections are taken from rooms that do not permit branch damper control furnish the supply and exhaust openings with louvres of key looked type to permit air adjustment.
- E. Where exhaust grilles are built into masonry construction, they shall be provided with angle frames etc: as indicated on Drawings.

15. MACHINERY GUARDS

Provide machinery guards to fully house the entire balt drive for the various fans, and other machinery furnished under this Contract. These guards are to be of heavy perforated metal, with necessary angles and shields and are to be furnished with a supporting attachment to allow for their easy removal, being fastened and erected with machine screws. These complete guards are to be galvanized. Provide opening for access panel opposite each shaft end, for the purpose of permitting the speed of the apparatus to be taken.

16. MACHINERY ISOLATION MATERIAL

- A. Under all fans, motors, and other mechanical apparatus subject to vibration, the Contractor shall furnish and install approved pattern vibration eliminator bases similar and equal to the double rubber-in-chear type as manufactured by the Vibration Eliminator So.
 - B. The Contractor shall guarantee that no objectionable vibration will be communicated to the building by the above equipment.
 - G. This Contractor shall make duct connections to and from all fans connected to ductwork by means of two thicknesses of heavy asbestos cloth to form flexible joints. The canvas shall be held in position by wrought iron hands, $1\frac{1}{6}$ " x 1/16", acrewed to the ducts by means of machine bolts placed on not greater than 4" centers, or equal method.

17. INSULATION AND SOUND ABSORBING FELT

A. This Contractor shall furnish and install pipe covering and insulation and duet insulation and sound absorbtion material for equipment supplied by him. All this work shall be done by a Specialist Sub-Contractor skilled in this particular line of work.

- B. Covering for fittings, valve bodies, specialties etc: shall be of some general type as specified for pipe work, and shall comprise specially moulded sections to fit the particular appliance. All pipe covering installed on exposed pipe in any finished section of the building shall be recenvassed with a covering of 8 ex. duck neatly sewn one Stitching to be on the top of the covering.
 - C. Furnish covering as follows:-

Apparatus

Boiler, Breeching, induced draft fan housing, condensate receiving tanko

Steam and Condensate Lines

Well Water Lines

Ductwork Sound Absorbing Linging va

Method of Covering

2" - 85% magnesia blocks wired on with non-corrosive wire, and finished with hard plaster troveled smooth with galvanized chicken wire mesh reinforcing.

Foundam pipe insulation to l_2^{-n} thick-ness as manufactured by Pittsburgh Corning Go., or equal. To be held in place by closed type Monel or type 304 stainless steel bands 3/8" wide.

Mystik Dri-Pipe insulation as manufactured by Mystik Adhesive Products, Chicago, Ill. or equal approved.

h thick approved firegroof accoustic felt securely cemented to inside of duets by using special cement as furnished by the manufacturer of the felt. Felt to be to Fire Underwriters requirements.

18. MOTORS AND CONTROLLERS

- A. This Contractor shall furnish and set all motors and controllers in connection with any apparatus supplied by him.
- Bo All motors are to be ball bearing 40°G induction motors and shall be arranged for A.C. electric supply as follows:
 - Up to \(\frac{1}{2}\) H.P. 120 Tolts Single Phase 60 cycles. \(\frac{1}{2}\) H.P. and above 208 Volts 3 phase 60 cycles.

Motors shall be quiet operating and are to be carefully selected to obtain this result. If any motor proves to be noisy after installation this Contractor shall replace same without additional appears to the City of County of Denver. All motors shall be of non-radio interferring type. To be of General Electric, Westinghouse, Electro Dynamic or equal make and to be provided with coat of shop paint.

- C. All controllers shall in general be of combination magnetic across line type arranged for remote control where indicated. In general they shall be similar to Westinghouse Type 11-206. To be of suitable size required for H.P. of each motor and to be single or three phase type as indicated above. To be weatherproof pattern when used in conjunction with Roof Type Exhaust Tans.
- D. Where indicated in connection with these controllers furnish remote control "Start Stop" push button starters with green jewel pilot lights of type similar and equal to Westinghouse #1033439.
- Recept where otherwise indicated on Drawings all controllers shall be meanted alongside the motor they control. The remote control push buttons shall be furnished to the Electrical Contractor for mounting on the Control Desk in the Engineers office.

19. FIRE DAMPERS

Furnish and fix where indicated on Drawings Fire Underwriters approved fusible link operated automatic fire dampers. These dampers shall be complete with frames suitable for mounting in each specific location. Provide proper access door adjacent each damper for setting of damper blades and removal of links etc:



SECTION NO. 3 - ARENA HEATING & VENTILATING SYSTEMS

1. INTAKE & DISCHARGE LOUVRES

In positions indicated and to sizes given on plans furnish and set the various weather-proof intake and discharge louvres. These shall be galvanized copper bearing steel with 16 gauge louvres and 14 gauge frames, suitably stiffened, weather-proof type with galvanized wire screens in heavy galvanized frames and complete with all necessary galvanized flashing to render them properly water tight when built in, all to Architect-Engineers' approval.

2. ARENA HEATERS

- A. On the mezzanine floors at each corner of the Arena furnish and fix a Warm Air Direct Fired Tubular Unit Heater of self-contained floor type construction as manufactured by the Lee Engineering Company of Hoboken, New Jersey or equal approved. The Heater shall be of welded steel construction with the blowing fans located at the rear end in which the cir is taken in at low level forced under pressure upward, through and around the heating elements and discharged at the top of the unit by means of adjustable outlets connected to a distributing duct system. The gas travel shall be so that the gases will pass downwardly and uniformly the length of the heating surface, while the air to be heated is passing upwardly uniformly through the same length, thus giving a true counter-flow travel of air and gases resulting in the highest efficiency possible. The air to be heated shall pass inside the 8 gauge boiler tubes and also over the corrugated shell.
- B. Each heater shall be capable of heating not less than 45,000 cubic ft. of hir per minute from 10°F. to 85°F. when using 835 B.T.U. gas at 1# pressure on less, at 5,500 altitude.
- C. The heating surface shall be gas tight welded steel construction consisting of a 10 gauge steel deeply corrugated shell, 1/4" steel end plates, and #8 B.W. gauge boiler tubes. To the outside corrugations and end plates there shall be welded 10 gauge steel fins parallel to the fir flow to act as radiating surfaces. There shall be not less than 1325 square feet of primary heating surface and not less than 281 square feet of secondary heating surface. The end plates shall be provided with necessiry firing openings and fire doors. The exhauster connection shall be welded steel construction complete with hand operated damper. The combustion chamber shall consist of not less than 9" thickness of first quality fire brick.
- D. The base of the heater shall be constructed of 3/16" steel plates. To longitudinally stiffen the entire base there shall be 3/16" steel plates the entire length of the heater continuously welder to each end plate and steel stiffener angles.

- R. The outer casing shall consist of 16 gauge steel plates properly stiffened and reinforced to form a suitable air—tight outer jacket. At that part of the heater where the fans are connected to outer casing, there shall be provided a flanged connection for the blowing fans. The top discharge shall be flanged for direct connection to distributing duet system.
- For the fan unit shell consist of one (1) blowing fan #445 type ME with Power limiting wheel as manufactured by New York Blower Company of Chicago, Illinois or equal approved. This shall be a D.I., D.W. fan having a capacity of 45,000 C.F.M. at 680 R.P.M. at 3" S.P. when handling air at 70° F. The induced draft fan shall consist of one (1) exhauster unit #30 type G.I. as manufactured by New York Blower Company of Chicago.or equal approved. This shall be S.I., S.W. having a capacity of 5,500 C.F.M. at 1" S.P. when handling air at 500° F. The fans shall be located on the floor at the rear of the heater. The blowing fan shall have a flanged outlet and the induced draft fan shall have a flanged inset and cleanout door in acroll.
- G. The blowing fan shall be connected to the heater by an asbestos cloth connection and shall be provided with anti-vibration base, both as hereinbefore specified.
- H. For V-belt drive to the above blowing fan there shall be provided a constant speed, continuous duty squirrel cage induction motor rated at 30 H.P. when operating at full load speed of 1,800 R.P.M. The starter for the motor shall be of income specified type with overload protection, and furnished complete with push button remote control station and an "automatic-manual" selector switch. Additional interlocks shall be provided so that in case of main motor failure provision will be made to automatically shut off the firing equipment.
- I. For V-belt drive to the induced draft fan there shall be provided.

 a single speed aquirrel cage induction motor must mixed may be specified with remote control push button station and one set of extra Contactors.
- J. For connecting the above motors to the fan units there shall be provided V-belt drives complete with belts and sheaves. The rating of the above belts and sheaves shall be 30% greater than the B.H.P. of the fan units. There shall also be provided a guard for the drive so constructed as to totally enclose the drive as hereinbefore specified. The two intakes of the blowing fans shall be provided with heavy galvanized wire mesh guards properly secured in place.
- Ko The firing equipment shall consist of one pressure burner suitable for burning 835 B.T.U. gas at 1# pressure or less and with sufficient capacity to deliver 5,700,000 B.T.U. per hour. The burner shall be fully automatic in operation with modulating control. The burner shall be complete with gas-electric ignition, pilot assembly, temperature controller and necessary relays and controls. Provide remote pilot light for mounting on the Engineer's office Control Panel to indicate when the burner is in operation. Do not include wiring to this from panel specified under "L" below.

- L. The firing equipment shall be cafeguarded by adequate flame protection with complete flame failure portection and programming relay system FF-5 as manufactured by Combustion Control Corpor tion of C ambridge, Massachusetts or equal approved. The heater controls, in addition to the above shall consist of high limit temperature controller, Mercoid stack limit switch, gas pressure limit switch, and all necessary relays and other controls for completely automatic operation of the heating system. Controls shall be mounted on a heavy steel panel securely factored to one end of the heater and wired. Wiring shall be run in rigid conduit and fastened to heater casing.
- M. Each unit to be shop painted with one cout of primer and one coat of grey enumel before delivery to site.
- N. Each heater shall be completely shop tested before delivery to site. Complete records of these shop tests shall be given covering air volumes, temperature rises, gas consumption, general performance etc.:- Architect-Engineer approval of the shop tests shall be obtained before delivery of any unit is commenced.

3. DUCTWORK, REGISTERS & DIFFUSERS

For this system furnish a complete range of sheet metal ductwork complete with registers, dampers, and diffusers etc.:- all as indicated on drawings and hereinbefore specified.

4. RECIRCULATION GRILLES, DAMPERS & FRAMES

- A. In connection with the Recirculation openings between the Arena and the four Mezzanine rooms, furnish the Recirculation Grilles, fromer and fire dampers to details indicated on Drawings. Each face grille in the Arena shall be 10 gauge plain stomped steel of size shown. This shall be mounted on a suitable angle aron from for building into the cluder block wall.
- B. On the back on each frome fix a set of Fire Dumpers of type herein-before specified. Extend the fromes beyond these fire dampers to house the Automatic Dumpers specified below. The whole general arrangement of the frames, dampers, grilles etc.:— to be as indicated. To be given one coat shop point before delivery.
- C. Each frame and its attachments shall be furnished and set complete in place in the wall opening.

5. AUTOMATIC DAMPERS

A. For the recirculation openings and fresh air intakes into each Mezzanine room Turnish automatic preumatically operated dumpers of types specified hereinafter. Dampers to be mounted in frames of types suitable for fixing directly behind the Intake Louvees and Recirculation Grilles frame specified hereinbefore.

B. For the Winter Heating only two sections of the intake dampers shall be provided as indicated on drawings. For the complete Summer Air Conditioning three sections shall be provided as indicated.

6. ROOF TYPE EXHAUST FANS

- A. Furnish, set and connect all roof type exhaust fans in positions indicated on Drawings. Fans to be of duties and sizes indicated. To be of type equal to Davidson Hyduty No. 25 construction "D" Design with self acting lowers as manufactured by Davidson Fan Company, Newton, Mass. for roof mounting. To be complete with driving motors of H.P. shown with Vee belt drives, fans to have galvanized housing.
- B. Motors to be as specified hereinbefore and to be provided with magnetic starters as specified hereinbefore with remote control push button starters.

7. AXIAL FLOW EXHAUST FANS

- A. In connection with the low level exhaust system from the Arena, the Basement exhaust and Team room exhaust, furnish and install fans of the Axial Flow type as manufactured by Joy Manufacturing Co., Pittsburg, Pa. or approved equal.
- B. Duties and sizes of these fans to be as indicated on Drawings. Fans to be complete with inlet bells, steel housings, fixed vanes and direct drive motors. Furnish and set magnetic starters of type specified hereinbefore with remote control push button starters.
- C. Fans to be suitable for duct mounting with connecting flanges on their housings, etc.:- and to be mounted on anti-wibration supports.

SECTION NO. 4 - ARENA AIR CONDITIONING

CHINERAL

1. This section of the Specification is intended to cover the provision of the extra fans, ductwork, cooling coils, cooling water supply piping etc :required to operate in conjunction with the apparatus specified in SECTION No. 3 herein to provide Summer Air Conditioning for the Arena.

B. It is to be clearly understood that for the purpose of Summer Air Conditioning the blower fans and their ductowrk, specified under SECTION NO. 5, Article 2., hereinbefore, will be operated in conjunction with the heater by-passes specified hereinbelow, as well as the equipment covered in this SECTION. Also the exhaust ventilation appearatus covered in SECTION NO. 3, hereinbefore will be operated in conjunction with both Summer and Winter systems.

2. COOLING COILS

4. Furnish and fix the cooling coils in the four Mezzanine rooms in positions and to details indicated on Drawings. These coils shall be of Aerofin, Trane or equal approved manufacture of plain cleanable tube type. with removable headers or equal means ar complete access to each individual tube. Coils to be mounted in frames suitable for ductwork connection as indicated. To be arranged for complete drainage with comptying cocks, connection etc: for this purpose. Provide vents at top of coils.

B. Furnish and fix proper supports for each coil and drip pans as hereinbefore specified.

32 PIPEWORK CONNECTIONS

TOTAL COMPRETIONS A. In connection with the Gooling Woils furnish and fix complete the supply pipework from the Wall Pump discharges to the coils. This pipe work to be flanged east iron with flanged cost iron fittings as hereinbefore specified. Include connection to Well Pumps discharge flanges, valves, check valves, automatic controls etc:- all as indicated on Drawings and specified. Make provision for draining this pipework at the point.

Bo Jurnish and fix the discharge pipework from the cooling coils to the nearest storm water leader drain as indicated. Include connection to "Y" fitting on leader furnished by others.

- C. Insulate above pipework as specified hereinbefore .
- D. In connection with Wells #3 and 4 provide Tes connection and walve adjacent Well Pump discharge, for connection by others of Refrigeration Plant condenser cooling pipework.

4. SUPPLY FANS & MOTORS

- A. This Contractor shall furnish and install all supply fans and motors required as given in the various schedules shown on the plans. Fans to be of American Blower Co., Charage Co., or Buffalo Forge Co., and shall be arranged for approved pattern V-belt drive. All fans to be equipped with inlet wane control for regulating air quantities.
- Bo Fans to be provided with asbestos cloth duct connections and vibration bases as specified hereinbefore. Also open wire mesh galvanized guards over suctions.
- G. Furnish and set V-belt drives with machinery guards, and motors and controllers as hereinhefore specified. Include remote control push button stations.

5. DUCTWORK & DIFFUSIRS

For this system furnish a complete range of sheet metal ductwork complete with registers, dampers, and diffusers etc: all as indicated on Drawings and hereinbefore specifies.

6. ARENA HEATER BY-PASSES

Article 2

In connection with the Arena Heaters specified under SECTION NO. 3/- here-indefore, furnish galvanized sheet metal by-passes for Surmer operation of the blowing fans. General arrangement of these to be as indicated on Drawings. Each by-rass to be furnished with heavy gauge manually operated shut-off damper, to close tightly against passage of air at 3ⁿ static pressure when in shut position.

SECTION NO. 5 - STEAM HEATING SYSTEM

1. GENERAL

The steam heating system shall comprise the steam boiler plant, steam and condensate pipe work, valves, fittings specialties etc.:- radiators, steam unit heaters, miscellaneous connections to steam using apparatus, oil burner equipment, condensate return pump etc.:- and all apparatus and materials to furnish complete the system required for all areas of the building other than the Arena.

2. BOILER PLANT & OIL BURNER INSTALLATION

- A. The work includes the furnishing and installation by This Contractor of one self-contained steam generating unit of the co-called "Package Type, as manufactured by Preferred Utilities Mfg. Corp. of New York City, N. Y. and equivalent to their size #300, consisting of a steel 4-pass herizontal fire tube type steam boiler, commonly known as a modified "Scotch Marine". On the chassis of this steam generating unit there will be installed a horizontal rotary cup fuel oil burner complete with controls and accessories piped, wired and mounted on structural steel base, all as hereinafter described and indicated on Drawings.
- B. This steam generator shall be tested under full load firing conditions at the manufacturer's factory to insure a complete working assembly and fulfillments of the performance guarantee. The unit steam generator shall be equipped with an induced draft heat fan of a recognized fan manufacturer, which fan must have adequate provision for dissipation from the bearings of the heat of the combustion gases passing through the fan. The manufacturer of the heat fan must show at least five years field experience of this fan of the same type and size provided for on the generator. There will be provided a vent pipe from the fan discharge extending to a point level with the top of the boiler shell. The unit shall receive a shop coat of aluminum paint prior to shipment.
- C. The steam generator shall be equipped with boiler trim to comply with all the requirements of the latest ASME Code for a maximum of 15 p.s.i.g. design pressure. The pressure vessel shall be tested under 100 lbs. hydrostatic pressure and certificates of inspection by a recognized boiler insurance company shall be furnished as a part of this requirement. The oil burning equipment, controls and wiring shall meet all the requirements of the National Bourd of Fire Underwriters, also all State and Municipal Codes.
- D. The sterm generator furnished shall show a thermal efficiency of 80% or more when unit is operated at full working load and pressure and when insulated with 2° of magnesia or its equivalent. The CC2 analysis of stack gas temperature shall be 13% and the temperature of the stack gas approximately 125 degrees F above the steam temperature.

- R. The unit shall have a maximum production of 10,850 bls. of steam per hour at an elevation of 5,500 ft. above seatlevel with water from and at 212 degrees F and when fired with commercial #6 fuel oil and supplied with electric service of 206 volf, 5 phase, 60 cycle alternating current.
- Fo Pressure vessel of the ateam generator shall be of the 4-pass horizontal fire tube down draft type and shall contain not less than 5 sq. ft. of heating surface for each rated horsepower. All necessary rafractory shall be supplied for the combustion chamber and baffles and suitable removable plates at each end shall be supplied with gas tight joints so that the head sheets may be accessible for cleaning, inspection, repair and replacement. The construction must be such that all tubes can be repaired, cleaned or replaced from the front end of the boiler. A pressure relief door-with pyrox glass observation port shall be provided in the rear of the first pass. Heavy structural steel H beam members suitably welded and braced shall form base for the whole chassis in such a manner that the entire weight of the unit and water may be supported on a flat foundation surface. Unit shall be leveled and suitable grouting provided under steel frame. The boiler shall be furnished with suitable handhole, steam outlet, return water openings for boiler water feed, and pop safety valves all as required by the latest Boiler Code of the ASME. Provision shall be made for floor drains underneath boiler shell,
 - Go Boiler trim to include not less than the following:

Water column complete with gauge glass, gauge cocks and try cocks.

Compound steam gauge, range 30" vacuum to 30", complete with syrhon and sock mounted on unit.

Safety valves as required by governing codes mounted on unit.

Dual automatic low water aut-offs and boiler feed with high water alarma

Steam actuated pressure controls for controlling burner operation.

Dial type thermometer mounted on vent.

- H. The unit shall be equipped with a motor driven fan of proper design and capacity to furnish all air required to fire the boiler at maximum capacity with a clear stack and at an elevation of 5,500 ft. above sea level. There shall be provided a fan control interlocked with the oil burner controls in such a manner as to prevent the operation of burner until required draft has been established by the fan. These controls shall operate in such a manner as to insure the fan continuing to run and scavenge the boiler passes of gases in event of the burner being shut down due to a flame failure.
- I. The oil burning equipment, as hereinefter described, shall be complete with all required safety controls, operating controls, oil pump, fam, wiring and oil piping on the unit tested and found in first class operating condition before shipment.

- J. There shall be installed, piped and wired as an integral part of the unit (an Underwriters' approved horizontal double belt driven rotary type oil burner arranged for the fully automatic burning of #6 fuel oil with volume valve viscosity regulator. Each unit shall have the burner equipped with an automatic system of connected and interlocked controls that will vary the oil and air supply in correct proportion at the dictation of the steam pressure control so as to insure good combustion on high and low firing rates. Burners equipped with automatic high-low control shall incure burner ignition on low fire setting only. Burner shall beequipped with a dual oil pump built as an integral part of the burner. The oil delivery to the atomizing cup shall be under the control of a metering device that will insure uniform delivery at its setting. Burner ignition shall be of the gas-electric type with igniter. transformer and gas valve built as an integral part of the burner. All oil piping shall be complete on the unit to the suction and return line connections which shall terminate at the side of the unit's platform or base and be fastened securely to the platform or base of the unit with metal straps. Separate suction and return oil lines shall be provided by the piping Contractor of a diameter recommended by the manufacturer of the steam generator.
- K. All safety and operating controls such as motor starter complete with overload protection, combustion safety control, low water cut-off, and fan control shall be furnished and installed in accordance with the rules and regulations of the Mational Board of Fire Underwriters. All controls and switches that are not required to be mounted on the boiler of the unit shall be mounted in a metal cabinet securely fastened to the unit.
- L. There shall be mounted and completely piped on the unit a hot water oil heater of sufficient capacity to heat double the amount of oil burned at maximim boiler capacity to the temperature required for satisfactory combustion. Heater shall be complete with thermostatically controlled circulating pump. This Contractor shall provide and install completely piped up. an hot water heating system to heat the oil in the fuel storage tank from cold starting. The pystem shall consist of an approved type electric immersion heater having a capacity sufficient to heat 240 G.P.M. through 100°F. temperature rise in 15 minutes. System shall be complete with hot water circulating pump, aquastat 5 gallon hot water expansion tank and necessary pressure temperature relief valves as required by State and Municipal Codes. A heavy fuel oil strainer shall be installed in the suction line and be valved so as to permit cleaning of the strainer without spilling of oil. There shall also be mounted on the burner an automatic thermostatically operated electric heater of sufficient capacity to beat the oil to minimum temperature required to maintain combustion until such time as sufficient hot water is generated in the boiler to operate the hot water oil heater. An additional flame failure control of the photo electric cell type shall be installed to be "Fireye" or approved equal.
- M. There shall be furnished by the manufacturer a field service engineer to make final adjustments of controls for oil after the unit has been set in place, suitably leveled and grouted and connected to all service lines for dil, electricity, water, steam and vent connections.
- N. From the outlet of the fan furnish and install a 30" dia. No. 12 gauge breeching and connect same to chimney.

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- O. Furnish and set where indicated on Drawings a fuel oil tank of capacity indicated. Tank to be of Underwriters approved pattern, welded and to be thoroughly coated with tar asphaltum both inside and out. To have flanged openings for 4" fill line, one suction line, one return line, one vent, hot water supply/return line to heater, and connection for liquid meter gauge. Also bolted 18" dia. manhole and gasket and one opening for emergency test will. How water supply and return, and oil return and suctions connections to be taken through a second manhole cover so as to allow for the heater being removed. Sil suction and return connection to terminate at heater in usual manner.
- P. Furnish and install suitable driversy type fill box of cast iron at the curb.
- Qo Furnish and completely install for the tank, one large pheamercator Talegauge Tankometer gauge. This gauge shall be mounted on the boiler room wall as directed by the Architect-Engineers and shall be equipped with gauge dial calibrated in gallons. Vent pipe from storage tank shall be located in a suitable corner of the building. Furnish and install in the fuel oil tank one suction bell oil heater of the "Paracoil" type. To be suitable for heating by hot water and shall be provided with oil suction and return delivery connections, etc:-

Re Furnish and install all required pipe, fittings, valves, etc., necessary to complete the tank storage and connecting to the outlets for suction and return provided in the oil burning unit. All oil valves shall be of the gate type and shall be of brass, while all oil piping shall be of steel, with the exception of the suction and return lines shall be of black wrought iron, All oil fittings shall be malleable. The following schedule of pipe sizes are minimum and are intended as a guide for the oil burner contractor.

All piping connections carrying fuel oil shall be made up with glycerine or equivalent, and to be tested and found tight at 100 lis. per sq. in. pressure.

So The suction and return lines from the storage tank to the burners shall be run at high level in the boiler room in as short a line as possible. Exposed oil lines to be covered with light thick wool felt sectional covering, canvas jacketed and banded.

- M. Starting from electrical outlet in boiler room which will be provided by others, this Contractor shall furnish a complete system of electric wiring from this outlet to the panel furnished with the generator. His work shall include the furnishing of an approved safety switch for remote control located outside of the boiler room.
- g. Furnish all permits required for the installation and operation of the above described oil burning equipment, tank, piping, etc., and shall prepare all plans and Drawings required to obtain these permits and to secure approval from the Architec-Engineers on the work installed. This Contractor shall further guarantee to pay all fees required to obtain permits for the complete recognition of the installation by Insurance, Fire Department according to the regulations of the Board of Standards & Appeals.
- W. Furnish and guarantee free service to the City and County Of Denver for a period of one year on the entire oil burner system as described above. Service shall be available day and night at all times.
- We This Contractor shall guarantee the entire system to be free from defects and to operate satisfactorily and efficiently and without smoke for a partied of one year. This guarantee to be furnished in writing to the necessary parties prior to the completion of the work.

3. RADIATORS

- A. Furnish and set all units of Radiation shown on the accompanying plans. Radiators shall contain the amount of surface given and their location shall be carefully checked with the Architect-Engineers finished dimensioned plans so as to fit properly and symetrically into the spaces provided.
- B. Radiators shall in general be of the Vulcan Finned tube type with Grille covers to sizes and lengths given on Drawings.

in accordance with schedule given on Drawings. The connections to the radiators shall in each case to run the full size given in this schedule, the reduction to the valve size being made in the albow looking toward the valve. The nipples between the valves and radiators shall be of the valve sizes. Where valves are located in horizontal branches, the steam valve shall in each case be the same as the size of the pipe to which valve is connected, and the return valve shall be connected into the piping with reducer and increaser fittings. All radiator branches and runouts are run exposed. It is the responsibility of this Contractor to see that these are run neatly so as to present a proper appearance when finished.

4. UNIT HEATERS

A. Furnish and install Unit heaters, where indicated on plans and to sizes and capacities shown. These heaters shall be of propellar type with welded and brazed finned copper tubular heating elements, 15 gauge minimum steel casings, dependant on heater size, and shall be complete with all necessary supports, brackets, and fixings. Their heating elements shall

have suitable provision for expension and shall be complete with steam and condensate headers and piping connections.

- B. Electric motors shall be of general type hereinbelow specified specially arranged for quiet operation with anti-vibration mounting maximum speed not to exceed 850 rpm on Units having fans 15" die. or greater, and 1125 rpm onunits having fans less than 15" die. Hotors to have totally enclosed packed bearings for easy maintenance. To be controlled by Thermostats as specified under SECTION NO. Therein. Furnish master electric out-out switches as indicated on Drawings. Fans to be aluminum or brass acquirately halanced.
- Go All Units to be works tested before delivery to site and furnished one cost works paint. Sating of Units to Souform to A.S.HoVoE Standard Gode.
- D. In connection with each unit farmish all piping connections, stop valve, condensation specialties, dirt pocket, stradner, etc. as hereinbefore specified. Size of connection as indicated on Drawings. Connections to be arranged for proper expansion movement, and to ensure proper drainage and operation free from water hammer.
- Ro Unit heater to be of standard quiet operating type manufactured by Modine, Trane, American Blower or equal.

5. MISCRILANEOUS STRAM CONNECTIONS

This Contractor shall make connections to all steam using appliances, whether such appliances are included in this Contract or not. In general gauges and instruments on appliances not furnished by this Contractor shall be furnished and set by the Contractor furnishing and setting the appliance. However the Heating Contractor shall include for all steam and condensation fittings, walves, specialties, etc:— required to complete the steam and complete connections to all appliances. Include steam stop valves for all appliances. Piping connections shall be made to suit the connection provided on each appliance, with proper arrangements being made for expansion etc:

6. CONDENSATE PUMP

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- A. At the point indicated on the plans, the Contractor shall furnish and install a Mash size #65020 duplex condensate pump or approved equal consisting of two close coupled motor driven centriffugal pumps bolted to the sides of a 33 gallon sast iron receiving tank. This receiving tank shall have a self cleaning strainer mounted in the receiver at the return inlet and accessible through a clean out plate.
- B. Each pump shall be a vertical split case, single stage, bronze fitted centrifugal pumps driven by a 12 HoF. 3500 r.p.m. motor wound for 5 phase, 50 cycle, 208 volts current. Each pump shall have a capacity for 45 gpm against 20 psi at the pumps discharge.
- the operation of migher pump according to the level of the water in the receiving tank. The float switch shall act as a pilot control for an automatic across—the white type starter, with overload and low voltage pro-

tection, furnished for each motor. These starters shall be arranged for wall or panel mounting.

7. ICE HINK MELTING COILS & CRATINGS

- A. Furnish and install the ice rink malting pit coils to details indicated on Brawings. These coils shall be clipped to the steel subway grating as shown and after clipping coil and grating shall be galvanized.
- B. Include for the grating and supports etc: all to details shown on Drawings.
- G. Include all steam and condensate piping and connections required for the coils with all valves, specialties etc:— as indicated on Drawings and specified hereinbefore.

SECTION NO. 6 - MISCHILANBOUS VENTILATION

1. GENERAL

The miscellaneous ventilation systems throughout the building comprise (a) Basement supply and exhaust, (b) Basement Dressing Room and Toilet exhaust, (c) Refrigeration room supply and exhaust, (d) Boiler Room Supply connection, (e) Gravity Systems for Transformer Booms, (f) Public Toilets exhausts (3), (g) Promenade and Entrence exhaust. These systems shall be provided complete with fans, ductwork, grilles, heaters, filters etc: all as hereinspecified.

2. INTAKE AND EXHAUST LOUVRES

Where indicated on Drawings furnish and set galvanized weatherproof intake and discharge louvres to sizes shown. To be of similar types to these specified under SECTION NO. 3, Article 1, hereinbefore.

3. FILTERS

In connection with the Basement Supply System furnish and install filters similar and equal to these manufactured by American Air Filter Co. of the wire mesh viscom coated, washable type. Include necessary holding frames suitable for duct connection, access doors etc:- Number of filter Units to be as indicated on Drawings.

4. HEATING COILS

In connection with the Basement supply furnish and install heating coils of size and duty as indicated on Drawings. These coils to be of non-freeze type similar and equal to the Aerofin make with finned tubes. Furnish necessary supports for heater, with ductwork commection, access doors etc:
Also all necessary steam and condensate connections, valves, specialties etc:as hereinbefore specified.

5. SUPPLY TAN & MOTORS

For the Basement Supply furnish and install supply fan and motor of same general type complete with accessories as specified hereinbefore under SECTION NO. 3, Article 4. Duty of fan and motor horsepower to be as indicated on Drawings.

6. REFRIGERATING HOOM SUPPLY UNIT

A. For the Befrigeration room supply furnish and install in position indicated on Drawings a ceiling mounting horizontal pattern ventilating Unit of type equal to that manufactured by American Blower, Clarage or equal approved. This Unit shall comprise fans, with motor and V-belt drive, heating coils and filters all mounted in one easing complete with all necessary supports and

fixings. The Unit shall be factory manufactured and be work tested before delivery. Furnish one cost works paint.

- B. The heating coils shall be of the finned tubular non-freeze type as manufactured by Aerofin or equal.
 - C. The filters shall be of the Throw-away type.
- Do The Unit driving motor and its controller shall be explosion proof type, but otherwise shall conform to general characteristics of this equipment specified hereinbefore.
- E. Unit shall be of capacity rating indicated on Drawings and shall be suitable for ductwork connection. To be arranged for 190% outdoor air supply only.
- 7. DUCTWORK: REGISTERS AND DIFFULK.S

For each system furnish a complete range of sheet metal ductwork, complete with registers, grilles, diffusers, dampers etc: all as indicated on Draw-ings and hereinbefore specified.

8. KCHAUST FAILS

- A. The exhaust fans in connection with these various systems shall be of types as follows:
- Bo For the Basement and Team Room fans shall be of the Axial Flow type as manufactured by Joy Manufacturing Co. Pittsburg, Pa. or approved equal to sizes and duties indicated on Drawings. To be complete with all accessories as specified in SECTION NO. 3, Article 7 hereinbefore.
- C. For Public Toilets and Promenade and Entrence exhausts, fens shall be of the Davidson roof type as specified in SECTION NO. 3, Article 6 herein to sizes and duties indicated on Drawings. To be complete with all accessories as previously indicated.
- D. For the Refrigeration room the exhaust fan shall be of the centrifugal blower type direct driven and having its motor mounted integral with the fan casing. To be of size and type indicated on Drawings and of pattern manufactured by American Elower, Charage or equal approved. The motor and controller for this fan shall be of explosion proof type, but otherwise in general characteristics shall confirm to apparatus of this type hereinbefore specified. Furnish and install supporting platform, hangers etc:— for suspension of this equipment at ceiling.
- E. For the rear Promanade exhaust fans shall be of the propeller type direct driven, to sizes and caracities indicated on Drawings. Motors and controllers to be of types hereinbefore specified with remote control push buttons stations. Fans to be suitable for mounting direct behind louvres. To be provided with aluminum non-return flap dampers.

SECTION NO. 7 - AUTUMATIC CONTROLS ETC

1. AUTOMATIC CONTROLS

- A. The automatic control system throughout the building shall be the product of a specialist manufacturer who shall furnish and install the equipment complete including all necessary labor, materials and service for this pneumatic system.
- B. Temperature control equipment shall be that as menufactured by the Minneapolis-Honeywell Regulator Company whose apparatus is indicated here-inafter or equal approved. The Meating Contractor shall obtain approval of the temperature control manufacturer whose system be proposes to use before plating any orders.
- G. The control system hereinafter specified shall be free from all defects in workmanship and material under normal use and service. If within twelve months from date of acceptance by the Architec-Engineers any of the equipment herein described is proved to be defective in workmanship or material it shall be replaced or repaired free of charge. After completion of the installation the automatic control Contractor shall regulate and adjust all devices provided under his contract, leaving same in complete sperating condition subject to the approval of the Architect-Engineers. The Contractor shall, after completion of the original test of the installation and acceptance by the Architect-Engineers, provide any service incidental to the proper performance of the temperature control system free of charge for a period of one year thereafter.
 - D. Compressed fir piping shall be galvanized steel pipe or seamless copperatuding as installation conditions require. Lit shall be concealed wherever possible, properly supported, and installed in a meet and workmantike manner throughout. But table drip-legs and drains shall be installed at all necessary points in order to prevent condensation pockets. All alectric wiring in connection with the control system shall be furnished by others as included under the electrical specifications.
 - K. All sutomatic valve bodies and dampers included as a part of this Contract shall be set in place by the Heating Contractor.
 - For the control of the Basement Ventilator heater, the main unit shall be contolled in two steps. The air to be heated to 45°F, by the tempering heater utilizing a Belfield Type FB valve, Model 70 two-position and a type IO-900A Gradustat. The secondary heater located a minimum of 18" from the tempering heater shall raise the temperature of the air to approximately 82° by utilizing a Type VO-52C modulating valve and a type IO-900A gradustat.
 - G. For the control of the Refrigeration supply unit furnish type W0-534 steam valve controlled by type T0-9004 room thermostat with low limit type L0-9004 control in fan discharge.

- H. For the control of room groups of radiators as indicated on Drawings furnish type VD -53A steam valves controlled by type TO-800A room thermostats. Sizes of valves to be as shown on Drawings.
- I. For the control of individual radiation: where indicated on Drawings furnish type V0-500A or V0-501A steam valves according to sizes controlled by type T0-900A room thermostats.
- J. For control of each unit heater throughout the building furnish a type TA-42A thermostat and a type LA-409A aquastat.
- K. For the control of the Arena heating system, each of the four areas shall be controlled by three Type TO-900A direct acting thermostats as located on plans which through a type LO-900B submaster and a type L91A pressure controller and a Type L-494H pneumatic electric relay will control a throttling gas valve, furnished by others, on the gas fired unit. A type TO-900A thermostat shall control through type MO-900C gradumotors with grads the type W-42 dampers for recirculated air and fresh air making the fresh air dampers to gradually open and the recirculating air damper to gradually close after the warming up period and to remain in those positions during the entire period of public occupancy.
- L. For the control of the summer cooling coils/each of four zones, type TO-900A reverse acting thermostats shall control type VO550 three-way valves in supplying cooled water to the cooling coils.
- M. For the control of the HWS tank heater in Team Room #2 quadrant 1 of the building furnish type V0-53B steam valve controlled by type L0-900A aquastat.
- N. A type WO-100B compressor shall be installed in the basement as located on the plans. It shall be a 1/2 H.P. high pressure compressor 1.7 cfm. 208 wolts, 3 phase complete with magnetic starter and belt guard. It shall be of sufficient capacity to supply all of the above instruments. To be complete with all necessary gauges, reducing valves, filters and automatic starting equipment.
- O. General location of thermostats and valves with sizes to be indicated on Drawings.

2. MULTI-POINT THERMOMETER

- A. Furnish and install a 24 point distant indicating thermometer equal to model 156 x 63 W 24 as manufactured by Brown Instrument Co. The actual instrument is to be mounted on the Control Board in the Engineers Office, and shall be supplied by this Contractor to the Electrical Contractor for mounting on the Board.
- B. This Contractor shall however include for all connections required for the thermometer including connecting all thermocouples with the instrument. Approximate position of each thermocouple is as indicated on Drawings. Allow sufficient wire and connection however for exactly locating the couples to Architect-Engineers final requirements during construction.

SECTION NO. 8 - DEDUCTABLE ALTERNATES AND UNIT PRICES

1. DEDUCTAPLE ALTERNATE NO. 1

- Omit A. Cooling coils together with their supply and discharge piping and all fittings and fixings insulation etc:— as specified in SECTION NO. 4, Articles 2 and 3 hereinbefore. Tee and valve connection at Wells No. 3 and 4 as specified under Article S(D) to remain.
 - B. Duotwork Connection from Intake Louvres to Cooling Coils.
 - C. One section each of Automatic intake and reciproclations dampers as specified under SECTION NO. 3, Article 5 hereinbefore.
 - D. Supply fans #215, 245, 275 and 295 together with driving motors and all accessories as specified under SECTION NO. 4, Article 4 hereinbefore.
 - E. Supply ductwork diffusers, and all accessories as indicated on Drawings and specified under SECTION NO. 4, Article 5 hereinbefore. Also heater by-passes with accessories as specified under SECTION NO. 4, Article 6.
 - F. All automatic controls required in connection with the cooling coils and the third section of the automatic dampers, including valves, damper motors etc:- as specified under SECTION NO. 7, Article 1, hereinbefore.

2. DEDUCTABLE ALTERNATE NO. 2

- Omit A. Ice rink melting pit coils together with gratings and all steam and drip connections, valves, specialties etc:- as specified under SECTION NO. 5, Article 7.
 - B. Brine heater steam and condensate connections with all valves, specialties eto:- from nearest steam and condensate mains.
 - C. Refrigeration room supply and exhaust ventilation systems complete, with all piping connections, automatic controls, intake and exhaust louvres etc:-

3. UNIT PRICES

Quote hourly labor rate in bid for temporary heating as called for in SECTION NO. 1, Article 12.

CONTRACT NO. 8 - PLUMBING & FIRE PROTECTION

SECTION NO. 1 - SPECIFIC REQUIREMENTS

1. APPLICABILITY OF COMPRACT DOCUMENTS

The Contract Dooments shall be those defined as such in the Agreement. The "General Conditions Governing All Contracts" shall apply to all work of this Contract.

2. SQOPE

It is the intention of these Specifications and the accompanying plans to include all labor and materials to install completely and leave is full and proper working order to the entire satisfaction of the City & County of Denver the complete plumbing services for the building.

These services comprise:

- As House and Sterm water drainage systems with all necessary soil, waste, went lines, drains etc: and plumbing fixtures and fittings. Also miscellam neous drain connections to apparatus furnished by others.
 - Bo Cold Water Supply System complete.
 - C. Hot Water Supply System complete.
- D. Fire Protection Systems with standpipes, Fire Department valves, Sarinkler system etc.
- R. Gas Supply System with connections to all gas using speliances even though said appliances are supplied by others.

This Contractor shall be responsible for the entire work and shall co-relate all systems to make a complete installation. All materials found necessary and desired, free from defects new, and of makes specified and all labor necessary shall be provided complete for these installations.

5. WORK NOT INCLUDED

- A. General painting of equipment furnished under this contract shall be done by others.
- B. All electric wiring will be done by others. The Plumbing Contractor shall only furnish and set controllers and motors, and he shall furnish to the Electrical Contractor all necessary wiring diagrams for the connection of his apparatus.

4. STANDARD DEFINITIONS

As used hereinafter the following definitions and abreviations shall apply.

A.S.M.R. - American Society of Mechanical Engineers

A.S.T.M. - American Society for Testing Materials

I.P.S. - Iron Pipe Size

M.P. - Mickle Plated A.G.A. - American Gas Association 5. SPECIAL CONDITIONS

A. It is the intention of these specifications and the drawings to call for finished work, ready for operation and therefore any apparatus, appliance of material not shown on Drawings but which is mentioned in the Specifications or vice-versa or any thing which may be necessary to make the work complete and perfect in all respects and ready for operation, even if not particularly specified, shall be furnished, delivered and installed by the Contractor the same as though specifically shown on Drawings or mentioned in the Specificatins without any additional expense to the City and County of Denver-

B. All materials and work must be new and of the best quality of their respective kinds, made and executed in accordance with the best shop practice and all labor is to be performed in a thorough and workmanlike manner by skilled workman. All materials shall be delivered and erected in place with sufficient rapidity so that the work may be performed to complete this installation at the time set forth as the date of completion.

Co. All piping shown on plans is diagramatic. Consult the Architeckian Engineers detail Brawings and constructional drawings for actual spaces available before installing pipes and apparatus. This Contractor shall cover such additional deviations from the plans as may become necessary to meet the actual structural conditions and to accommodate apparatus installed by other parties, also minor alterations of work already installed, and discrepancies in estimate measurements made from plans, and any extra services, labor and materials not mentioned herein that may be necessary to comply with all laws and regulations of all departments having jurisdiction over this work.

Do This Contractor shall furnish all necessary templates, patterns, for installing his work and for the purpose of making adjoining work conformables any dimensioned detailed sketches showing the size and construction of his apparatus and material as may be required by the Architect-Engineers.

E. This Contractor shall inform kinself fully regarding peculiarities and limitation of space available for the installation of all his apparatus.

To This Contractor shall be responsible for the perfect operation of the entire work on this Contract and shall make good and repair without expense to the City and County of Denvero any part of the work which is imperfect or which may be clogged or inoperative due to lack of protection during construction, to defective material or to poor workmenship.

- Go This Contractor shall see that all of his equipment such as valves, traps, elecnouts, etc., which it may be necessary to reach at intervals for operations and maintenance purposes shall be fixed in fully accessible positions.
- H. This Contractor is to protect and insure his own materials being responsible in every respect for all parts of the plans, whether paid for or not, unith his work is completed, the apparatus accepted and left in charge of the City and County of Denver. Rrect all sheds for storage of materials and provide temporary office for plans, details, records etc:-
- I. This Contractor shall furnish the services of an experienced Superintendent who shall constantly be in charge of the installation of the plumbing and associated works together with all skilled workmen, plumbers, fitters, welders helpers and labor required to properly unload, transfer, erect, connect up, adjust, start, operate and test the systems.
- J. All materials furnished, and all work installed under this Contract shall comply with all rules and regulations of the State of Colorado and local City laws affecting the same. Should there be any conflict between plans and Specification and the above mentioned laws and regulations, the laws and regulations shall take precedence.
- To Contractor's attention is particularly called to the fact that all lines where exposed must run "CLOSE" to all walls and cailings. All clean-outs for concealed lines are to be turned up and are to come flush with floors. They are to be located close to walls or partitions. Contractor shall install wooden blocks in all lines, in all cleanouts, and in the ends of all pipe rane during construction work so that no foreign matter will enter the pipes.
- L. All sublet connections, pipes, etc., are to be carefully centered, and the Contractor is solconsult the dimensioned construction plans. All lines are to be installed in the proper manner to take care of expansion and contraction, and to secure proper drainage and venting.
- Mo The service lines, house drains, roughing work, shall be installed as soon as conditions at the building will permit.
- M. This Contractor shall make arrangements with the General Contractor for light, electric power and telephone in connection with the execution of this contract.
- O. There no specific kind or quantity of material is given a first class standard article as approved by the Architect-Engineers will be furnished.
- Po This Contractor shall furnish all scaffolding and equipment required for the installation of his works
- Q. Small details not usually shown or specified, but necessary for the proper installation and finishing shall be included in the Contractors estimate, the same as if herein specified or shown.

6. CODE HULES, PERMITS & INSPECTIONS

- A. The Contractor shall give all necessary notices, shall file all plans, obtain all permits and pay all fees in connection with this work, and obtain all necessary approvals of all departments having jurisdiction over this work He shall obtain all certificates of inspection for this work and deliver same to the Architect-Engineers.
- B. All materials furnished, and all work installed under this contract shall comply with all rules and regulations of the State of Colorado and local laws affecting the same. Should there be any conflict between plans and Specifications, and the above mentioned laws and regulations, the laws and regulations shall take precedence.
- G. No pipe, fittings, or other work of any kind, shall be covered up or hidden from view before it has been all examined or approved by the Architect-Engineers, or any other authority having jurisdiction over the same. Any unfaithful or imperfect work or materials which may be discovered shall be removed and corrected immediately after being condemned, and other work and materials shall be furnished which shall be satisfactory to the Architect-Engineers.

7. DETAIL DRAWINGS

- A. The Plumbing Contractor shall furnish all necessary templates, patterns, etc., for installing his work and for the purpose of making adjoining work conform and he shall furnish setting plans and shop details for all branches of the work as required. Where said Drawings are approved by the Architects, Engineers, said approval does not in any way relieve the Contractor from the responsibility nor necessity of furnishing material or parforming work required by the Contract Drawings and Specifications.
- B. The Plumbing Contractor shall furnish for approval detail dimensioned brawings showing the construction, size, arrangement, etc., of all approximates and specialties, etc., and such other detail information concerning which the Architect-Engineers may desire detail information or which may be required for the building construction. Number of copies of drawings submitted to be as required.
- C. The Plumbing Contractor shall submit a list of materials giving manufacturer and figured numbers for the approval of the Architect-Engineers. The Plumbing Contractor's desire to use materials of manufacture given herein after does not relieve him of submitting a list.

8. EXCAVATION

A. Mass excavation to approximate building levels will be carried out by others. This Contractor shall however do all treach and pit excavation and back filling work required for this work inside and outside the building including repairing of finished surfaces as required.

- B. In this connection the Contractor shall make all arrangements with the City and County of Denver, fill all applications, obtain all permits and pay all fees etc:— and generally carry out the works to City and County requirements.
- Vated is earth, unless otherwise indicated on the Drawings. Earth shall be defined as being such material as can be removed by and handled by hand methods or by standard power shovel equipment. Shale or rock that can be removed and handled by hand methods or by standard power shovel equipment shall be classified as earth.
- D. If excavation of rock other than that described above and not indicated on drawings becomes necessary, or if the quantities of earth excavations are increased or decreased by changes in the work by the Architector Engineers, the difference in cost thereof will be suitably adjusted.
 - Bo Boulders over a cubic yard will be considered rock.

9. CUPTING & PATCHING

- A. General Contractor is to provide the necessary chases shafts and trenches in walls and floors for the Plumbing Contractors services where required. Quases etc:— are to be located by the Plumbing Contractor, who is to determine the size and location as desired, and if this Contractor does not supply the proper information to the General Contractor, he is to pay for making the necessary changes or corrections.
- B. This Gontractor shall furnish and install all aboves and inserts required before the floors and walls are built, or shall himself be reaponsible for all cutting and patching required for pipes where sleeves and inserts were not installed; or where insorrectly located. All holes cut through concrete arches shall be punched or drilled from under side of arches.
- G. If, after the General Contractor has made any openings at the request of the Plumbing Contractor, the Plumbing Contractor decides to change the locations of such openings, he shall pay the General Contractor for doing the additional work.

10. FOUNDATIONS & PIERS

Any foundations and piers required for the installation of work included in this Contract shall be furnished by the Plumbing Contractor. He shall furnish all necessary supports undermeath the horizontal lines, as required. Drawings of his proposed arrangements for these piers and foundations, etc., shall be submitted to the Architect-Engineers for their approval before construction is commenced.

11. TESTS

A. Make all tests required by the Architect-Engineers or by the State and City Departments. These tests shall be closely supervised by the

Plumbing Contractor and make in the presence of the required representatives and the representative of the Architect-Reginers.

- B. The Plumbing Contractor shall fully test all mater lines with full mater pressure. Under this test, all piping and connections shall be left in an absolutely drip tight condition. Any leaks or defects which may as velop shall be taken onre of by the installation of new material and no completing will be permitted.
- Contractor shall edjust the various supply valves, fixture fittings, etc., so that the proper delivery of mater is obtained at all fixtures. Before work is finally turned over to the City and County of Denver, the Plumbing Contractor shall make such additional edjustments as may be found necessary to deliver the job in proper working conditions. At this time, all fixtures, equatcheous fittings, and name plates, pipe covering, and finish in general, shall be completely gone over by the Plumbing Contractor and left in properly finished and neat condition.

12. TESPORARY COMERCTIONS & FACILITIES

This Contractor shall furnish a temporary cold water service for the building during construction to the General Contractors requirements. Furnish also toilet adomodations for building for all motions as required, including necessary enclosures and screens. Turnish and connect one Fire Hydrent in losation as required. Hydrent to be standard City Fire Department type.

15. GUARMITAE

1. This Contractor shall guarantee to, at his own expense, replace or repair promptly any workmanchin or materials in which defects may develop within one [1] year from date of final acceptance of his work.

B. There such defects occur, this Contractor shall be held responsible for all costs incurred in making the defective work good and all injuries to plaster, wood or other finish caused by such replacements and repairs of defective work shall be replaced and repaired in first class condition by this Contractor at his own expense.

This Contractor shall furnish certificates of guarantee from the manufacturer of specialties furnished under this Contract to the effect that they will furnish new parts or apparatus where defects occur due to faulty manufacture, for a period of one year from date of final socceptance.

14. RECORD DRAWINGS

A. This Contractor shall keep a complete and accurate record of all deviations in the location of all pipes, pipe sixes, etc., from the Contract Drawings, as well as all pipes laid under floors or not shown on the Drawings and shall on the completion of the work, furnish one set of cloth tracings showing the exact location of all pipes control values, specialties etc.

B. In the preparation of these tracings, the Contractor may make use of lithograph prints of the Architect-Engineers Contract Brawings if he so desires. He shall however provide such lithograph prints at his eva expense.

plan of all plumbing systems showing controls for sems. Three copies of each chart to be provided.

15. COST OF TEMPORARY SERVICES

This Contractor shall include his proportionate share of the expense for water, electricity, heat, telephone and disposal of rubbish etc. mused during the entire period of his Contract as may be agreed upon between the Contractor for Contract No. 1 and this Contractor.

SECTION NO. 2 - MATERIALS

This Section of the Specification deals with materials to be used in General. For particulars of use of materials in individual systems see sundry headings as well as below.

All materials and equipment furnished and installed under this Contract shall be new and of the best quality of the kind specified and shall be free from defects of any character. All workmanship shall be first class and subject to the approval of the Architect-Engineers.

The manufacturer's name or trade mark shall be stamped or cast on all pipe and fittings which shall be marked for gauge and weight.

1. CAST IRON PIPE

A. All cast iron pipe and fittings shall be sound, smooth, gray iron, free from cracks, and holes and other defects. Pipes and fittings shall be of uniform thickness and of a grade known as "Extra Heavy" manufactured by the Alabama Pipe Co., Central Foundry Company, Essex Foundry Company, or equal make. Pipe shall be marked with the maker's name or trade name and weight of pipe. Weight, including the hub, shall not be less than the following:

Diameter	2"	Weight	per	Lin.	Ft.	5-1/2	lbs.
#	3"	Ħ	_ n		*	2-1/2	Ħ
'n	4"	*	Ħ	Ħ	Ħ	13-1/2	**
•	6*	w	*	Ħ	11	20	•
	8"		71	n	**	33-1/2	#
	LO"	•			Marian Salah	45	

Be where specified cast iron pipe and fittings shall be cement lined throughout. Such pipe shall be of type manufactured by McWare Cast Iron Pipe Co., or equal approved.

2. SALT CLAZED VITRIFIED CLAY PIPE

Salt glazed vitrified clay pipe shall be of standard weight and sizes to A.S.T.M. standards for double strength pipe with socket and spigot joints as manufactured by General Ceramics Corporation.

3. LEAD PIPE

Lead pipe shall be of the best quality lead, not less than 8 lbs. per lineal feet, 4" in diameter, 6 lbs. per foot, for 3" diameter, and of weight in proportion for smaller sizes.

4. STEEL PIPE

Steel pipe shall be double dipped galvanized or black, standard weight mild steel pipe as made by National Tube Co., Bethlehem Steel Co., or equal approved.

5. COPPER & BRASS PIPE

- A. Where copper pipe and fittings are called for the same shall mean to be copper water tube pipe of weights as given in Government Specifications type K and shall be as furnished by Phelps-Bodge Copper Products Corporation, American Brass Co., Chase Brass & Copper Compank, or equal, and shell be of 99.9% copper.
- B. Red Brass pipe shall be 85% copper and 15% zine seamless semiannealed iron pipe size as manufactured by Chase Brass Co., Revere Copper & Brass Co., or equal.
- G. For sizes la and below Type L Copper pipe of similar manufacture may be used as an alternate to the Type K specified above.

6. WROUGHT IRON PIPE

Wrought iron pipe shall be double dipped galvanized or black, genuine, puddled-wrought iron as manufactured by A.M. Byers Co. or equal approved.

7. FITTINGS

2:4

- A. Fittings for cast iron drainage and underground water pipe shall be of east iron of corresponding quality and thickness as the pipe for each class of service.
- Bo Fittings on brass or copper pipe above 2. shall be of standard screwed cast brass of the same composition as specified for pipe. Fittings on chromium plated brass pipe shall also be chromium plated. Fittings 2" and smaller shall be wrought copper sweat or brazed fittings, all being made with approved solder and non corrosive flux.
- Q. Fittings for steel pipe shall be cast iron or malleable fittings with heavy beeds of standard design as manufactured by a major specialties manufacturer. To be black or galvanized as required.
- D. Fittings for wrought iron pipe shall be standard weight galvanized or black malleable fittings as above.
- E. Fittings for screwed drainage piping shall be standard galvanized cast iron drainage fittings, and for vent piping shall be galvanized standard malleable iron fittings, all of long radius pattern.
- F. All couplings and nipples in connection with the galvanized wrought iron pipe shall be galvanized genuine wrought iron. Weight not less than that of corresponding pipe.

- G. Fittings for selt glazed witrified tile pipe shall be selt glazed vitrified tile bell and spigot type to double strength standard.
- He Welded fixtings may be substituted for serew fittings on gas lines if space conditions require it and if approval is secured from the Architect-Engineers. Any welding shall be done in strict accordance with the requirements laid down for Welding in the Specifications for Heating Ventilating and Air Conditioning.
- Is All fittings on all lines, where branches are taken off, or where branches diminish in size, are to be reducing fittings. This applies to all types of fittings, whether brass, copper, cast or malleable. Ho bushings will be permitted in connection with any pipe lines.

8. JOINTS

- A. All joints in cost iron pipe shall be made with picked cakum and molten lead and shall be made gas-tight. No less than 12 oz. of fine soft pig lead shall be used at each joint for 1" in diameter of pipe. Connections between lead and cast iron pipe shall be made with breas ferrules coulked into the iron pipe hub, as previously specified. Lead pipe shall be attached to the ferrules by means of a wiped joints
- B. For screwed pipe joints all pipe ends are to have the burns carefully removed, and all threads carefully cut. Short lengths of pipe are not to be used where full lengths can be installed. The screwed joints of genuine wrought iron and steel pipe shall be made tight with a thick paste of red and white lead, mixed in linseed oil, unless otherwise indicated or requirede Lemp wick will not be permitted in any ease. All pipe connected to recess fittings shall be screwed close up to their shoulders.
- C. All wrought iron pipe ends shall have the burrs removed. All lengths of pipe shall meet at ends in couplings. All wrought iron pipe shall have mite or red lead applied to the threads of all pipes. No lead applied to the threads of all pipes. No lead applied to the threads of all pipes. No lead applied be used in the couplings of fittings. Connections between wrought iron pipe and cast iron pipe shall be saulked, joints made as herein described for cast iron pipe. The end of the wrought iron pipe shall be fitted with a ring or part of a coupling screwed on to form a spiget. Connections between lead and wrought iron pipe shall be made with brass soldering mipples, of the same size as the iron or steel pipe, and the lead pipe shall be attached by means of a wiped joint.
- The screwed joints of breas pipes shall be made tight with litharge and glycering. The use of prepared pipe compounds on brass pipe will only be permitted after the Plumbing Contractor has proved to the satisfaction of the Architect-Engineers that he can produce a job equal to that specified. Particular attention shall be paid to the threading and joining of the pipe. The threads shall be properly cut, clean, even and free from all abrasions in order to insure a first-class tight job. There brass pipe is joined to galvanized pipe, particular care shall be taken to prevent galvanic action and joint shall be made as directed. Faucets, etc., connections shall be made with thick paste of red lead and oil to assure easy disconnection when desired.

Bell and spigot joints in tile pipe shall be made with picked caking or samp gaskets packed into the annual spaces between the pipes. The remaining space shall be filled with poured asphaltic jointing material or los coment mortar. When making the poured joint the annualar space shall be kept thoroughly dry.

9. TRAPS

The plumbing Contractor shall furnish and set a suitable trap for each plumbing fixture included in this centract, drain, drain point, etc., furnishing all necessary vents, all to meet the requirements of the local plumbing code. Traps and connections shall be of sizes given in fixture schedule.

10. VALVES & TAGE

- As All valves shall be suitable for 125 lines, working pressure. All valves shall be properly packed with approved packing by the Plumbing Contractor and left drip tight. All valves 85 and over, unless otherwise called for, shall be iron bedy with broase or breas wheels, and held in place by haragon mats. All valves, unless otherwise called for, shall be gate valves. The Plumbing Contractor shall furnish valves for all of the various lines at each specialty, and as herein called for and shown on the accompanying plans. Valves shall be heavy pattern Jenkins Broa., Ludlew, Walworth, or equal make, All valves shall be finished or plated to match their respective pipe connections.
- B. Check valves shall be of all bronze, herizontal swing check pattern up to and including 2. Over 2", these valves shall have cast iron bodiese. These shall be furnished with composition renewable discs.
- The Plumbing Contractor shall equip each valve with the proper size areas tag, secured to the valve wheel by brass links. This tag shall be mumbered or lettered, and Contractor shall prepare a triplicate schedule tabulating the valve numbers and designating the lines or apparatus controlled by the valve. Two of these schedules shall be framed under glass and placed as directed by the City and County of Denver.

11. SILL COOKS

The Plumbing Contractor shall furnish and fix sill cocks in location shown on Drawings as hereinafter specified. Sill cocks shall be 3/4" polished breas loose key lock shield compression hose cocks as manufactured by Crane Co., or equal.

18. SLEEVES & PLATES

A. The Plumbing Contractor shell furnish and install pipe sleeves for all lines passing through floors, wells, partitions, furring, roof and foundations. Sleeves for building walls where constructed of brick or masonry shall be of wrought iron pipe, two pipe sizes larger than the pipe passing through them. These sleeves are to be cut the proper length to extend the full length of the wall or partition, including the finish. Where pipes are covarid,

the sleeves shall be of sufficient size so that the covering may extend through aleeves. For all lines passing through floors, furred ceilings, or thin partitions, the Plumbing Contractor shall furnish and set #16 gauge galvanized iron sleeves of the full thickness of construction, finish to finish.

Bo The Plumbing Contractor is to use the utmost care in aligning the pipe sleeves and where lines or branches are run in horizontal chases, the Plumbing Contractor shall set proper pipe sleeves to allow for movement of pipe and to protect them from the building construction. After pipes are installed through exterior wall sleeves, the space between pipes and sleeves shall be caulked with lead and wool and made watertight. Approved type of malleable or steel plates, one piece, shall be provided at all walls, floors, ceilings, or partitions. All branch connections to plumbing fixtures shall be provided with chromium plated escutcheons, or wall or floor plates of approved design.

13. HAMMERS & BRACKETS

A. The Plumbing Contractor shall furnish and set all required pipe hangers for the proper support of all piping installed under this Contract, where lines are run along walls, furnish approved type wall hangers. Where pipes are suspended, furnish wrought iron expansion hangers, Orinnell, Clipbar, Crane or equal.

B. For the support of riser lines, etc., at each floor, the Plumbing Contractor shall furnish wrought iron pipe clamps, and for the support of underground lines, furnish the necessary brick or concrete piers to give proper support. All hangers shall be put up atraight and true, and in perfect alignment and no hangers shall be placed near couplings or fittings without making proper provision for expansion. Hangers shall be placed approximately at 12 ft. intervals, except in connection with east iron lines, in which case a hanger shall be provided for each pipe length.

C. In the Basement Storage Area all pipe hangers are to be spaced at approximately half the spacings above specified and are to be rigidly held to prevent any swing of the pipes.

14. AIR CHAMBER

For each isolated water closet, furnish air chamber of lime capped pipe approximately 4 ft. high and for each battery of water closet, lavatories or urinals install at the end of each branch main an air chamber of the same pipe size as the largest branch, chamber to be approximately 4 ft. long installed vertically.

15. FLOOR DRAINS

All floor drains shall be to sizes shown on Drawings as required and shall be Josam #5440 or approved equal, except the drains in the areas liable to be occupied by animals as indicated on the Drawings. The floor drains in these areas shall be Josam series #5150 extra heavy or approved equal.

16. ROOF DRAINS

All roof drains shall be to sizes shows on Drawings as required and shall be ZURN #150 or approved equal except the Entrance Lobby Roof, the drains for this roof shall be ZURN #125 or approved equal.

17. SHOWER DRAINS

Shower drains in the Team Rooms shall be Josam #5440 or approved equal and shall be equipped with running traps and vents. Shower drains in the Dressing Rooms shall be an intigral part of the pre-cost receptors and shall be equipped with running traps and vents.

18. INSULATION

- A. The Plumbing Contractor shall furnish and install pipe covering and insulation for all the various lines installed by him. All pipe covering is to be furnished and applied by a firm skilled in this particular line of work Furnish covering as follows:
- B. The covering for fittings, valve bodies, specialties, etc. shall be magnesia cement, or long fibre asbestos cement felting and is to be of material to match and of thickness to equal the adjacent sectional covering and shall be furnished with canvas finish. All pipe covering installed on exposed pipe in any finished portion of the building, shall be recenvassed with an additional covering of 8 oz. duck neatly sewed on. Stitching to be made on the top of the covering.

Piping or Apparatus

Cold water lines and leader carains where apposed.
Leaders #2.#11.#20 and #29.

Hot water service lines.

" Hot water storage tanks & heaters.

Method of Covering

Mystik Dri-pipe insulation as manufactured by Mystik Adhesive Products Chicago, Ill. or equal-approved.

Formglass pipe insulation 12" thick as manufactured by Pittsburgh Corning Corp. to be held in place by closed type monel or type 304 stainless steel bands 3/8" wide by .015" thick as manufactured by, ACME Steel Co. and Republic Steel Co.

12" Foamglass to be applied with hot asphalt, surface to be primed with a coat of asphalt primer and to be banded with closed type monel or type 304 stainless steel bands 12" wide x .035 thick as manufactured by ACME Steel Co. and Republic Steel Co.

SECTION NO. 3 - HOUSE & STORM WATER DRAINAGE SYSTEMS

1. GENERAL

As The house drainage systems shall comprise complete separate systems of soil and rain water drainage, with vents, traps, drains, and all necessary accessories but not including connections to street sewer, for new building all as specified herein and indicated on Drawings.

Bo Include all excevation and backfilling is connection with these systems as hereinbefore specified.

2. SOIL & WASTE LINES

A. Pipe - Cast iron pipe as specified shall be used for all underground drainage pipings inside building. Other underground lines in vitrified tile as noted.

Calvanized, wrought iron standard weight pipe shall be used for soil risers in shafts and branch waste lines where in furred ceilings.

Brass pipe shall be used for horizontal waste lines concealed in wall construction.

B. Fittings - For soil and waste lines in cast iron, cast iron soil
pipe fittings shall be used. For lines in wrought iron use
galvanized cast iron drainage fittings. For lines in vitrified, use vitrified tile fittings as specified.

No waste line, if installed undermeath basement floor, shall
be of size less than 2°, of east iron pipe.

29 ANI TIMES

For all vent lines standard weight galvanized wrought iron pipe with galpanized malleable iron beaded fittings shall be used. Furnish the vent lines complete as required by Code and as indicated on Brawings; as required for the systems proper operation. Furnish fresh air intakes complete as indicated and as required by Code. Continue vents through roof to sizes as required, completing these in cast iron with flashing as specified hereinafter.

4. FLASHING

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As This Contractor shall furnish and fix all flashing required both internally and externally for all his various systems. Flashing shall be made to suit building construction and Architec-Ingineers requirements.

Bo For the floor drains where above Basement, furnish 25" square 4 lb. lead flashing and flash to floor drain in proper manner.

4 lb lead
00 For the roof drains furnish and install/Edward remains flashing, not less than 24" x 24" set in place ready for roofer to make his connections to same.

D. All openings in the roof for vant or other plumbing pipes shall be flashed with 20 oz. copper sheets 18" square, each with a 12" tube of the same weight copper soldered thereto. A coupling recessed at the bottom shall be attached to the pipe and made water-tight.

5. CONNECTIONS TO FIXTURES

Furnish and install all connections for soil and vent lines to the plumbing fixtures and all other fixtures requiring them. Trap each fixture
separately. All exposed vent and waste connections are to be run with
standard weight iron pipe size red brass chromium plated pipe and chromium
plated fittings. Include wall and floor plates, escutcheous, etc. for these
connections and make connections as required by fixture manufacturers.

6. ROOF LEADERS AND DRAINS

- A. This Contractor shall furnish and install complete system of storm water drainage. This system shall be quite separate from the main house drainage system.
- B. For leaders and rain water drains underground salt glazed vitrified tile pipe and fiffing as herein before specified shall be used as indicated on plans. For vertical leaders to roof drains galvanized wrought iron pipe with galvanized cast iron drainage fittings shall be used.
- ② "Y" drainage fitting connections of sizes as required shall be provided in certain leaders, as indicated on Drawings, to take discharge from air conditioning cooling coils.
- D. Include all area and roof drains together with flashing and connections to leaders, all as hereinbefore specified.

7. FLOOR DRAINS

- A. Furnish and set floor drains of varying types, As hereinbefore specified, in positions indicated on Drawings. Setting of these to be to Architect-Engineers requirements as regards levels.
- B. Include flashing to all floor drains where required as specified here-inbefore.

8. CLRANOUTS

Furnish and set brass screw-plug cleanouts at the ends of all horizontal drainage lines, at the foot of all risers, at changes in direction, and at other points as indicated on plans. These cleanouts shall be full size of pipe. Furnish and set full "Y" fittings throughout the entire that all ation, furnishing cleanouts in all changes of direction of lines, at the ends of lines and at intervals of approximately 50 feet on all horizontal runs.

Gleanouts for lines which are concealed or below floors shall be extended up to the finished floor surface, with 45 deg. and 1/6 bend fittings, and shall be furnished with brass screws, set flush with the finish. Where eleanouts are in partitions or wall construction, they are to be similarly equipped. Floor cleanouts to be located near walls or partitions.

9. MISCRIANHOUS APPARATUS DRAINS

This Contractor shall farmish and fix the drains from the various drip trays and from all other small apparatus requiring draining. Where exposed, these wastes shall be run in copper pipe with sweat solder fittings. Hun all such drains to nearest waste with proper connection in approved namer. Include drains for hot water heaters, safety valves, pump glands. Refrigerating compressors, condensers, air conditioning apparatus, boilers etc.

10. SERVICE CONNECTIONS

A. This Contractor shall terminate his work on the service connections of the house drainage systems at the discharge points as shown on Brewings. From this point onward outfall lines shall be provided by others.

B. No street service connections shall be included in this Contract for might house or storm water drainage outfalls.

SECTION NO. 2 - COLD WATER SERVICE

1. GENERAL

- As The cold water supply system shall comprise a complete system for the building with street service connection, distribution pipework, valves, fittings, connections to plumbing and other fixtures and all accessories as specified herein and indicated on Drawings.
- B. Include all excavation and backfilling and repairing in connection with street service mains and other work as hereinbefore specified.

2. DISTRIBUTION LINKS

- A. Pipe and Fittings For all distributing pipe work and lines, use galvanized iron pipe with fittings throughout.
- B. Furnish and fix the distribution system complete with pipe fittings, valves, cocks, and all accessories as specified herein and shown on drawings with connections as hereinafter specified.
- C. All branch lines supplying fixture groups, and all isolated fixtures, shall be valved. Lines shall be so installed that they will grade to low points, and at low points Contractor shall furnish drain pocket, with plugged drain valves, to allow for the complete drainage of the entire piping systems.
- Do All water lines and branches shall be run concealed wherever possible except in Basement, unless marked otherwise on plans.

3. SERVICE SUPPLY

- A. Furnish and fix complete as indicated on Drawings the street service connection to the building. Connection shall be run in coment lined cast iron pipe and fittings.
- B. Include for cost of connection from Property Line to street main as required by the Board of Water Commissioners of the City of Denver.
- Co Furnish Mater Pit at Property Line to requirements of the Board of Water Commissioners.
- P. Furnish and fix water meters as indicated on Brawings and to sizes and requirements of Board of Water Commissioners. Include all isolating valves, shock valves, fittings ato: as required.
- R. The whole of this work to be carried out to the requirements and complete satisfaction of the Board of Water Commissioners of the City of Denver. Include for all fees, charges, permits etc: required in connection with this work as hereinbefore specified.

4. CONSIDITIONS TO SILLOCKS

Furnish and install sillecoks outside of building near grade and also inside of type hereinbefore specified, as indicated on Drawings. Make 5/4" cold water connection to each sillecok, valving off each branch connection in accessible locations outside of building. Endagenthing drawings. Furnish and fix any other garden services shown on Drawings.

5. CONNECTIONS TO MISCRILANEOUS APPARATUS ..

- A. This Contractor shall furnish and fix complete all cold water feed connections to all apparatus throughout the building requiring cold water supply even if such apparatus is not to be furnished under this Contract.
- B. Such feed connections shall normally be run in galvanized wrought iron pipe similarly to the general cold water distribution system. However, particular care shall be taken to ensure that in connecting to copper apparatus no actual contact between galvanized and copper materials results. In these instances a short piece of steel or brass pipe shall be used to make the actual connection.
- G. Principal apparatus requiring cold water feed is Hot Water Tanks and Heaters, Refrigerating Equipment, Heating Plant, Gas Fired Boiler etc:-

6. ARENA HOSE VALVES

A. Furnish and fix in locations in the Arena as indicated two $1\frac{1}{2}$ size hose valves with piping connections, for flooding the Arena ice floor.

7. CONNECTIONS TO FIXTURES

This Contractor shall furnish all connections to Plumbing fixtures, and all other fixtures requiring cold water supply throughout, the building, whether supplied under this Contract or not.

- B. All exposed pipework for all fixtures shall be red brass pipe to iron pipe sizes, chromium plated. All fittings shall be similar, also firomium plated. Include floor and wall plates, escutcheons, etc., as required.
- Os After plaster and painting work is completed, thoroughly clean all fixture connections and fixtures supplied under this Contract, and regulate the water supply to the fixtures, all in a manner as approved.
- D. Valve all sonnections to all fixtures. Sizes of fixture connections for plumbing fixtures as indicated on fixture schedule in this Expecification. Size of connections to fixtures supplied by others shall be as shown on Drawings.

8. AUTOMATIC FLUSHING VALVES

Provide for/three (3) urinals or less, one automatic flush valve with timer to operate at 5 minute/intervales. Flush valves to be a type equal to Sloan Specification No. 186. Timer to be energised by remote control from the Engineers Office. Push button by this Contractor, to be mounted on sentral control panel furnished by others, to be equal to Westinghouse type #1035459.

SECTION NO. 5 - HOT WATER SERVICE

1. CHRIERAL

The hot water service supply systems shall include the complete installation throughout the building of both local and general systems with supply and circulating lines, pumps, hot water supply tanks, hot water heaters, summer gas fired boiler, etc: Include for insulation of all hot water lines, tanks and heaters, fixture connections etc:

2. HOT WATER SUPPLY TANK AND HEATER

- A. Furnish and fix in position indicated on Drawings the Hot Water storage tank and heater to service Quadrant []. of the building. The tank shall be of 575 gal. storage capacity and shall be of welded steel plate construction, galvanized, and to ASMS code for LED p.s.i. working pressure with 300 p.s.i. test. Tank size 42" x 96".
- B. Tank shall be complete with all necessary hot, cold sirculating, respecting and instrument connections. Include also east iron meddles and supporting steel as indicated. Also brass angle thermometer of Taylor or equal manufacture and bronze water pressure relief valve of Assam or manufacture. Pipe discharge from this valve to floor drain as directed.
 - G. Tank to be insulated as specified hereinbefore.
- D. Tank to have copper U tube heater with minimum of 30 sq.ft. of heating surface, arranged with removable head and steem chest so as to be removable for inspection. To be complete with proper supports for expansion, and suitable for working pressure of 15 pp.s.is; with 300 lb test.
 - Thermostatic controls for tank to be furnished under amother Contract
 - F. Tank and heater to be furnished by SURFACE COMBUSTION CORPORATION approved equal.

3. GAS FIRED STRAM BOILER

- As In connection with the above Bot Water Service heater furnish and install an automatically controlled Gas Fired summer standby boiler including piping connections, asslating valves etc. as indicated on Brawings.
- Bo Beiler to be similar and equal to JANITROL 8-H-4D, having an American was Association rating of not less than 1580 sq.ft. steem.
- Q. Boiler to be complete with Automatic burner controls, insulated casing, water level indicator cold water feed control, safety valve, 6" steem pressure gauge and all usual fittings and accessories.

D. Furnish and fix the Transite flue, with drip pocket and connections etc: as indicated on Drawings.

4. CAS FIRED HOT WATER SUPPLY UNITS

In connection with the supply to the Teilets in Quantumnts #{1} and (2) of the building furnish and fix in position shown automatically controlled gas fired hot water heaters of type equal to JANITROL 4-D-20, having an American Gas Association rating of not less than 410 sq.ft. water.

5. KLECTRIC HOT WATER SUPPLY UNIT

In connection with the supply to the toilets in Quadrant #(3) of the building furnish and fix electric hot water supply heater of type equal to ten (10) gale storage heater as manufactured by Brunns Corp. of Milwaukee, Wisconsin.

6. DISTRIBUTION AND CURCULATING LINES

As Pipe and Fittings - For all distributing and circulating lines use copper. The and fittings as hereinbefore specified.

B. Furnish and fix the complete system of distributing and circulating lines for the building including valves, fittings, supports, etc., etc., all as shown on Brawings. All these lines shall be insulated as hereinbefore specified.

7. MINEULATING PUMPS

Furnish and install becater sireulating pump on the circulating lines in position shows on Drawings. Pump shell be of the centrifugal type with motors mounted as consumity the the pump, as manufactured by Tarush Baliland Cossett, Janette, etc. Duty of pump to be 15 g.p.m. at 10 ft. head 2 H.P. motor. Provide manual starting switch for pump.

8. CONNECTIONS TO MIXTURES

As Furnish and install all connections to plumbing fixtures generally as indicated hereinbefore. Piping connections to these fixtures to be run in red brass pipe iron pipe size chromium plated with shromium plated fitstings. Valve all fixture connections.

" B. For sizes of connections to plumbing fixtures, see schedule in this Specification.

SECTION NO. 6 . FIRE PROTECTION SERVICES

1. GENERAL

A. The fire protection services for the building shall comprise a standpipe and sprinkler system, together with fire extinguishers located in positions shown. Stand pipe system shall be connected to the street main as shown.

B. Complete system shall be installed as required by the City of Denver Fire Department and to National Board of Fire Underwriters requirements.

2. PIPEWORK & FITTINGS

For Standpipes and sprinkler system use attanded weight Black steel pipe and fitting throughout. Fittings to be of screw type for all sizes up to put not including 4. For sizes of 4. and larger use flanged fittings.
All piping shall be installed in accordance with the Sational Board of Fire Underwriters requirements:

5. STANDPIPE SYSTEM

Standpipes shall be provided and located as shown on plans, and to be in accordance with the fire Underwriters requirements, and the fire Department of the City of Denver. 1½" valves shall be provided where indicated and shall be the fire Department of the City of Denver's Standard. The usual arrangement of alarms, emergency shut-off valves etc; shall be provided. No hose racks or hose shall be included for.

4. SPRINKLER SYSTEM

A. Furnish and install a wet sprikkler system where called for on the Drawings to General details as shown.

Bo This system shall be of standard type for ordinary hazard occupancy to meet Fire Underwriters requirements, provided with alarm valve similar or equal to Cremell Model #A with gong. Sprinkler heads shall be $\frac{1}{2}$ " Standard Underwriters approved pattern of 160°F.

Go A separate street service connection shall be provided for the sprinkler system as indicated on drawings. This connection shall not be metered.

5. CITY FIRE DEPARTMENT CONNECTIONS

In position indicated on Drawings and as required furnish Siemese connections for City Fire Department connections. These shall be chromium plated, Standard City of Denver Fire Department type and shall be complete with connections, check valves, fittings etc:— all as required the Fire Department.

6. FIRE EXTINGUISHERS

- A. At all general locations in the building as indicated on Drawings, furnish and fix 2 gallon polished copper sods acid fire extinguishers in flush mounting recessed on binets with glass panel doors.
- B. In all plant rooms and also in other spaces where indicated furnish and fix 15 lb. carbon diexide fire extinguishers complete with wall mounting brackets and all necessary fittings, as manufactured by Walter Kiddee Company.
- C. Leave all extinguishers fully charged and in proper working order. Position of all extinguishers to be sheeked and approved by City of Denver Fire Department and Architect-Engineers.

SECTION NO. 7 - GAS SUPPLY

1. CENERAL

The gas supply system shall be supplied from the street gas supply mains and shall comprise distributing pipe work with isolating valves and all necessary accessories feeding gas using fixtures for heating and hot water supply etc:-

2. SERVIOR SUPPLY

- A. In connection with the Gas Service Supply include for cost of street connection, furnishing and setting of meters, excavation etc: all as required by the Public Service Co. of Colorado.
- B. The meter Boom will be provided under another Contract. However, it shall be this Contractors responsibility to see that this room and its arrangements etc:— are to the requirements of the Public Service Co. of a Colorado.
- Co Include for all fees, charges, parmits etc: required in connection with this work as hereinbefore specified.

S. CAS CUIL-OFF VALVE

If required by the Fire Department of the City of Denver, this Contractor shall include for furnishing and fixing, in position required, a gas safety cut-off valve of approved pattern on the main supply to the building.

4. DISTRIBUTION PIPESORK

- A. Pipe and fittings Distributing pipework in building shall be ran in black standard weight genuine wrought iron pipe with black malleable fittings to sizes and arrangements shown on Drawings.
- B. All pipe work shall be pitched and necessary drip pockets, fittings and accessories etc. shall be provided to properly drain all pipework throughout the building.

5. CONNECTIONS TO FIXTURES

- A. Furnish and fix connections to all gas using appliances throughout the building even though such appliances are not included in this Contract and will be furnished and set by others. Furnish stop cocks of approved pattern at each appliance. Make connections in manner required by appliance manufacturer.
- B. Automatic controls for such appliances shall in general be supplied by their manufacturers except as specified hereinbefore.

6. ARENA OUTLET FACILITIES

Furnish and fix where indicated on drawings Gas Service Stops similar to type No. 272, as manufactured by the Crane Co., and mounted in single gang conduit boxes with cover plates similar to type F. D., as manufactured by the Russell & Stoll Co.

7. PROMENADE AREA FACILITIES

Furnish and fix where indicated on drawings Gas Service Stops similar to type No. 272, as manufactured by the Crane Co.

SECTION NO. 8 - PLUMBING FIXTURES AND FITTINGS

1. PLUGING FIXTURES

As All fixtures shown on plans or stipulated on the schedule given herein below are to be furnished and net in place in eccondance with these specifications and the plans which accompany them.

B. All fixtures are to be set and supplied with waste and supply fittings, somplete, free from all defects, where shown on plans and left in satisfactory working order.

0. Since of branch hot and cold mater compections to fixtures shall be as follows:

	9034	Hot
Lavatorias		ें देख
Sinks	3/4*	. ∑
Service Sinks	- 3/4"	8/4*
Showers	3/4*	5/47
Water Closet	12"	***
Urinals	jĪ:	
Drinking Fountains	- 19 👫	* este

D. Trap each fixture separately and as alose to outlets as practicable. Furnish valves on all hot and cold water connections to each fixture. Connect traps with main or branch waste and vents with short lead, brass or iron branches from main supplies, as specified. Anything omitted herein but down on the plans is to be included.

2. All brass work around the plumbing fixtures, such as faucets, drains, fittings, valves, braps, wastes, plping, esouscheons, hardware, shall be brass having chronium finish, or equal.

Fo After plaster and painting work is completed, thoroughly clean all fixtures, and fixture trimmings and regulate the water supply to the fixtures, all in a manner as approved.

G. Fixtures numbers given below refer in general to catalogue of Grene Company to indicate the type and quality of fixtures desired for the work. Similar fixtures as furnished by Standard or General General Company or equal are acceptable. Before ordering fixture the Plumbing Contractor shall submit three sets of fixture cuts and fixture roughings for approval.

2. FIXTURE SCHEDULE

Furnish fixtures as follows:

Fixture

Water Closets

Lavatories

Service Sinks

Urinals

Type

Crene 3-450 "King Cotton" extra heavy washout, large trapway regular rim closet with 1-1/2" back spud.
Sloam #120 FYV "Crown" flush valve with 1" angle screwdriver stop, V-100-A vacuum breaker and flush connection.
Chunch #5700 Sani-Black hard rubber open front seat with check hinge.
Cast brass floor flange with nuts, bolts and gasket.
Chromium plated cap muts and washers.

Crame 1-510-P "Rhodile" 20 x 18" white main resisting porcelain enamel on cast iron wall hung levatory with 15-1/2 x 10" rectangular basin and soap depression. Concealed hanger attached to iron fish plates with long through bolts, nuts and washers.

8-36 "Victor" Magiclose self-closing lavatory faucets with hooded four-arm metal handles.

8-350 -1-1/4" P.O. plug with chain stay, chain and stopper.

8-300 - 5/8" angle supplies to wall with serewdriver stops and 8-325 reducers.
1-1/4 x 1-1/2" cast brass "P" trap.

Orane 7-561, 22 x 18" white acid remisting porcelain enamel on cast iron inside, painted outside, roll rim service sink with 12" back and concealed hangers. 8-100 "Telsa" 1/2" rough nickel plated faucet with "Newsleeve" trimming units and renewable seats.
7-620 - 5.5" cast iron enameled inside "P" two standard with metal strainer and rough

Crane 7-115 "Bedfordshire" white vitreous china washout wall hung urinal with integral strainer, 3/4" top inlet and 1-1/2" bottom outlet with tailpiece.

Supported on wall with long through bolts, nuts and washers attached to iron fish plates. Sloan #186 "Grown" flush valve with 3/4" angle screwdriver stop, vacuum breaker and flush connection.

1-1/2 x 1-1/2" cast brass "P" trap.

brass cleanout plug.

Fixture

Showers - Concealed Mixing Valve Type

Showers - Two-Valve Type

Drinking Fountain

Type

Crane 2-410 "Rival" 1/2 Symmons #1500-2"
belanced type mixing valve with ½" combination stop and check valves. Shower with renewable seats, 1/2" female inlets, lever control handle and wall escutcheon, 9-251 "Refresher" shower head with adjustable ball joint, 1/2"bent arm to wall and wall flange.

Crane 2-355 "Regal" 1/2" concealed two-valve shower fixture with 1/2" bress union inlets, valves on 8" centers with "Dial-ese" control units and indexed hooded lever handles and escutcheons, 9-231 "Refreshor" shower head with adjustable ball joint with 1/2" bent arm to wall and wall flange.

Corwith 6 9062 vitreous china wall drinking fountain with integral strainer, brass screws with cap nuts and washers.
Supply: Brass supply fitting with Purflo angle stream bublar, automatic stream regulator, screw-driver stop, and Victor self-closing stop with Magiclose Control unit.
Trap: 0 9980 12 I.P.S. galvanized Pr trap.

SECTION RO. 9 - DEDUCTABLE ALTERNATES

1. DEDUCTABLE ALTERNATE NO. 1

- Omit A. Drains from drip pans under Arena Mezzanine Room cooling coils to leaders.
 - B. Drains from Well pump pits No. 1 and 2, to nearest storm water drain.
 - Connections from Mezganine room cooling coils.

2. DEDUCTABLE ALTERNATE NO. 2

- Omit A. Drains from Ice melting pits to nearest storm water drain.
 - B. Floor drains from Refrigeration Plant room to nearest storm water drain. Also miscellaneous small drains from refrigerating machinery to floor drain.
 - Connections from refrigeration condensers.
 - D. 12 Cold water hose valves and their piping connection from nearest cold water main as specified under SECTION NO. 4, Article 6 hereinbefore.
 - E. Any cold water connections in Refrigerating plant room from nearcet cold water main.
 - P. Fire Extinguishers provided in Befrigerating Plant room.

CONTRACT NO. 4 - HIMSPHICAL POWER AND LIGHTING

SHOTION NO. 1 - SPHCIFIC HEQUIREMENTS

1. APPLICABILITY OF CONFRACT DOCUMENTS

The Contract Documents shall be those defined as such in the Agreement. The "General Conditions Coverning All Contracts" shall apply to all work of this Contract.

2. SCOPE

It is the intention of these Specifications and the accompanying plans to include all labor and materials to install completely and leave in full and proper working order to the complete satisfaction of the City and County of Denver the following systems as shown on Drawings and herein called for:-

- A. Complete Light and Power installation for the building, including High Tension distribution feeder and switchgear; unit transformer substations; extension distribution panels, feeders and buses; distribution conduit and wiring; lighting fixtures etc:
 - B. Emergency lighting installation.
- C. Ommunications installation including Public Address system, empty telephone and Western Union conduit systems, Fire Alarm System etc.
- D. This Contractor is to do all electric wiring for all motors, controllers, switches, remote control apparatus, starters, etc., indicated on plans and harein called for, and as indicated in the Specifications of other trades, although said motors; controllers, etc., are not necessarily included in this Contract.
- E. This Contractor shall be responsible for the entire Electrical work and shall corelate all systems and services to make a complete installation.

S. WORK NOT INCLUDED

- As General Painting of all apparatus furnished under this Contract will be done by others.
- Bo Electrical specialties such as motors etc: together with their controlling switches pertaining to other trades will be furnished and set by others. The Electric Contractor is to furnish and install the necessary and required conduit, fittings, wire etc: wire and connect all such specialties and controls, as hereinafter specified, and shown on plans.

4. STANDARD DESTRIPTIONS

As used hereinafter the following abbreviations shall apply?

W.R.C. - Estional Misstrie Sode

A.I. E.E. - American Institute of Electrical Engineers

A. B. T.Mo - American . Society for Testing Materials

H. E.M. A. - Hational Electric Menutacourers Association.

4.8.4. . American Standards Association

5. SPROTAL CONDITIONS

As It is the intention of these Specifications and the Drawings to call for finished work, ready for operation and therefore any apparatus applications on material not show on Drawings but which is mentioned in the Specifications or wice verse or anything which may be necessary to make the work complete and perfect in all respects and ready for operation, even if not particularly specified, shall be furnished, delivered and installed by the Contractor without any additional expense to the City and County of Denver.

B. All materials and work must be new and of the best quality of their prespective kinds, made and executed in accordance with the best shop preside and all labor is to be performed in a therough and workmanlike manner by skilled workman. All materials shall be delivered and erected in place with sufficient regidity so that the work may be performed to complete this incatallation at the time set forth as the date of completion.

Designment the Architect-Engineers detail Fravings and constructional archings for assembly spaces available and for all building details before the attailing any apparatus. The Hiestric Contractor shall cover such additional deviations from the plans as may become measure to meet the actual structural conditions and to accomplate apparatus installed by other parties, also minor alterations of work already installed to suit decoration and trim, and discrepancies in estimate measurements made from plans, and any extra service labor and materials not menti med herein that may be necessary to comply with all laws and regulations of all departments having jurisdiction over this works.

D. This Contractor shall furnish all necessary templates, patterns for installing his work and for the purpose of making adjoining work conformables, any dimensioned detailed sketches dimensing the size and mentionation of his apparatus and meterial as may be required by the Architect-Engineers.

This Contractor shall inform himself fully regarding pecularities and limitations of space available for the installation of all his apparatus.

F. Where no specified kind or quality of material is given, a firstclass standard article as approved by Architect-Engineers, shall be furnished and installed.

- Go Small details not usually shown or specified, but necessary for the proper installation and finishing shall be included in the Electric Contractors' estimate, the same as if herein specified or shown.
- H. The various runs of conduit as shown on the accompanying Drawings are not necessarily the actual locations in which the Eletric Contractor is to install the lines, but are for the purpose of estimating the work, showing the method of connection and for showing the controls, etc.
- I. The Electric Contractor shall be responsible for the perfect operation of the entire work in this Contract and shall make good and repair without expense to the City and County of Denver any part of the work which is imperfect or which may become clogged or inoperative due to lack of protection during construction, to defective material, or to poor workmenship.
- J. This Contractor shall see that all of his equipment which it may be necessary to reach at intervals for operation and maintenance purposes shall be fixed in fully accessible positions.
- Ko This Contractor shall protect and insure his own materials and shall be responsible for all parts, apparatus, equipments whether paid for or not, in his custody or left in charge of the City and County of Denver, and whether paid or not, until such time as the entire work is completed and accepted by the City and County of Denver. Erect all sheds for storage of material, and provide temporary office for plans, details, records etc:-
- L. This Contractor shall furnish the service of an experienced Superintendent who shall constantly be in charge of the installation of the Electrical and associated works together with all skilled workmen, electricians, fitters, helpers and labor required to properly unload transfer, erect, connect up, adjust, start, operate and test the systems.
- Mo The entire system shall be installed strictly in accordance with the Eational Electric Code requirements. If any conflictions arise between the Specifications and the Code, the Code requirements shall take precedent.
- No The Contractor shall make arrangements with the General Contractor for telephone, water and toilet facilities in connection with the execution of this Contracto
- O. Electric outlets as shown are the approximate positions desired and the correct positions are to be obtained from the final dimensioned construction Drawings. The Contractor is to confer with the Architect-Engineers as to the exact heights and location desired for the various wwitch, base, clock, fire alarm, and specialty outlets.
- P. All light outlets, base outlets, switch runs, radio, bell and fire alarm outlets, etc., are to be carefully located immiform positions throughout the various rooms and this Contractor is to consult the working dimensioned construction Drawings as the accompanying plans are not to be sealed and do not show the floor or ceiling construction. This Contractor will be held responsible for the proper placing of outlets, and should the same prove to be in wrong positions, he is to relocate them without additional expense to the City and County of Denver.

- The Contractor is to consult the construction plans and confer with the General Contractor to determine where furred or hung ceilings are to be installed, and he is to be guided accordingly in the placement of his outlets.
- R. This Contractor is to furnish all scaffolding and equipment required for the installation of his work.

6. CODE HILES PERMITS AND INSPECTIONS

- A. This Contractor shall give all necessary notices, obtain all permits and pay all fees in connection with his work. He shall obtain all certificates of inspection and approval for all work, paying all costs for the same and deliver the same to the Architect-Engineers.
- B. All materials furnished and all work installed under this Contract shall comply with all rules and regulations of the State of Colorado and any local laws affecting the same, as well as the rules and regulations of the National Board of Fire Underwriters. All material and apparatus used shall bear Underwriters approved labels.
- C. No pipe, fittings, or other work of any kind shall be covered up or hidden from view before it has been examined and approved by Architect— Engineers or any other authority having jurisdiction over the same. Any unfaithful or imperfect work or materials which may be discovered shall be removed and corrected immediately after being condemned, and other work and materials shall be furnished which shall be satisfactory to the Architect— Engineers, at no extra cost to the City and County of Denver.

7. DETAIL DRAWINGS

- Patterns, etc., for installing his work and for the purpose of making adjoining work to more and hesshall furnish setting plans and shop details for all branches of the work as required. Where said Brawings are approved by the Architect-Engineers said approval does not relieve the Contractor in any way from the responsibility nor necessity of furnishing material or performing work required by the Contract Drawings and Specifications.
- B. The Electric Contractor shall furnish for approval detail dimensioned Drawingsmahowing the construction, size, arrangement, etc., of all switch-boards, electric specialties, etc., and such other detail information concerning which the Architect-Engineers may desire information or which may be required for the building construction. Number of copies of Drawings submitted shall be as required.
- O. The Electric Contractor shall submit a list of materials giving manufacturer and figure; numbers for approval of the Architect-Engineers. The Electric Contractor's desire to use materials of manufacture given herein-after does not relieve him of submitting subhimplist.

8. EXCLANATION

- A. Mass execution to approximate building levels will be carried out by others. This Contractor shell however do all trench and pit execution and back filling work required for him work inside and outside the building including repairing of finished surfaces as required.
- Bo In this connection the Contractor shall make all arrangements with the City and County of Denver, fill all applications, obtain all permits and pay all fees etc:— and generally carry out the works to City and County esquirements.
- O. The Contract is based upon the assumption that material to be excavated in earth, unless otherwise indicated on the Drawings. Earth shall be defined as being such material as can be removed by and handled by hand methods or by standard power shovel equipment. Shale or rock that can be removed and handled by hand methods or by standard power shovel equipment shall be characted as earth.
- D. If excevation of rock other than that described above and not indicated on drawings becomes necessary, or if the grantities of earth excevations are increased or decreased by changes in the work by the Architecter Engineers, the difference in cost thereof will be suitably adjusted.
 - E. Boulders over 1/2 cubic yard will be considered rock.

9. OUTTING & PATCHING

The General Contractor will provide passages or chases for the installation of riser conduits where possible in the new construction, but the Electrical Contractor is to give proper information to the General Contractor for any such changes or openings desired. The Electric Contractor shall also furnish to the General Contractor the increasery alceves which are to be constitued on the General Contractor the increasery alceves which are to be given correct location of these sleaves. Should the Electric Contractor give wrong information, or should be not see that the openings are left in a proper place he is to pay the General Contractor for making the necessary corrections.

10. FOUNDATIONS & PIRRS

The Electric Contractor shall furnish all necessary foundations, fixings and piers for his apparatus. Drawings of his proposed arrangements for these fixtures, etc. shall be submitted to the Architect-Engineers for approval; before their construction is commenced.

11. TESTS

The Meetric Contractor is to test out all wiring and is to leave the same free from grounds, crosses, shorts, etc. He is also to test all electric light fixtures, together with switches and controls, the operation of all motors, controllers and other electrical apparatus and devices even though

the same are not included in this contract, but are indicated on the accompanying Brawings or herein mentioned. These tests are also to determine that the motors are running in the proper direction and that the centrollers are functioning in the proper manner. We shall leave all material and apparatus in proper and satisfactory working conditions.

18. TEMPORARY SERVICE

- As The Electrical Contractor shall farmish and connect to the main service point and maintain for the duration of the construction a complete system, of temporary lighting and power to illuminate the entire building, and premises, including catwalk, stairways, field offices and all points adjacent to work.
- B. Artificial illumination shall be sufficient to assume safe access to and about the work and safe and speedy construction according to the details and terms of the various Contracts and as determined by the Architect-Engineers.
- G. A total of 50 strings of temporary lighting and power shall be supplied as an initial quantity. The Electrical Contractor with his bil shall submit a Unit price for any additional strings required.

13. GUARANTEE

- A. This Contractor shall guarantee to, at his ewn expense, replace or repair promptly any workmanship or materials in which defects may develop withmen one (1) year from date of final acceptance of his work.
- Bo Where such defects occur, this Contractor shall be held responsible for all costs incurred in making the defective work good and all injuries to existing work caused by such replacements and repairs of defective work shall be replaced and remaindring first class condition by this Contractor at his country expense.
- G. He shall furnish certificates of guarantee from the manufacturer of specialties furnished under this contract to the effect that they will furnish new parts or apparatus where defects occur due to faulty manufacture for a period of one year from the date of final acceptance.

14. RECORD BRAWINGS

- A. The Electrical Contractor shall complete an exact detailed record of all changes in the location of outlets, circuits, devices appliances that may take place during the progress of the work. This record shall also show any additional lines or outlets that may be installed, which are not shown on the Contract Brawings. The plans shall include detailed plans or diagrams of all electric systems. showing the location of the same, method of connection, etc., to the extent that any competent person can trace the wiring thereforms
- B. In the preparation of these tracings, the Contractor may make use of lithograph prints of the Architect-Engineers Contract Drawings if he so desires. He shall however provide such lithograph prints at his own expense.

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15. COST OF TEMPORARY SERVICES

This Contractor shall include his proportionate share of the expense for water, electricity, heat, telephone and disposal of rubbish etc: used during the matire period of his Contract as may be agreed upon between the Contractor for Contract No. 1 and this Contractor.

SECTION NO. 2 - BUSDUCTS, DONDUIT WORK, SWITCHES AND RECEPTACLES

1. CONDUITS

- As Rigid (unlined) conduits shall be used for feeders and branch circuits and contain the number, type and size of conductors as indicated on the plans or as specified under branch circuits. All conduit shall be of steel tubing specially made for the purpose and shall be galvanized or sheradized on the outside. All conduit shall be given a coating of linesed oil compound baked on the outside. The surface of the conduit both inside and out, shall be smooth, hard and flexible. Conduit shall be as furnished by National Electric Products Corp., General Electric, Youngstown, Garland or equal approved.
- B. Sizes of conduits used for the various feeders shall be as indicated on the plans and feeder schedule. The minimum size of conduit to be used for light and power feeders and branch circuits is 3/4" inside diameter.
- C. This Contractor shall furnish and install suitable condulets, or equal, and flexible connections to motors, and other equipment where necessary, and required.
- D. All conduit couplings and joints are to be made in a water tight manner. Full length conduits shall be used to eliminate as many couplings as possible.
- E. Furnish and install all necessary special fittings in connection with the type of conduit to be used, said fittings to be galvanized.
- F. In all cases where the conduits are shown to be installed exposed, they must be run in a neat worksenlike menner at right angles to the walls and partitions substantially as shown on the plans, suitable approved conduit fittings shall be used in place of outlet boxes in all such cases.
 - G. Where conduits can not be run in furred ceiling or floor fill, they shall be installed in the neutral axis of concrete beams, or concrete floor construction.
 - H. Provide all necessary clips, fixings and supports for conduits whereever required. Ground all conduits as required and all electrical apparatus, motors, etc., as called for by National Electric Code.
 - I. Circuit runs to all panels shall be installed with as few creatings as possible, and in straight lines between outlets. Each line shall have not more bends than will permit the ready fishing of all wires. All conduits shall butt. Furnish all suitable locknuts and bushings for all conduits, where they enter or leave boxes, panels, etc., all to be made up tight.
 - J. All bends, offsets, etc., in the smaller sizes of conduit shall be made by the Contractor, provided a suitable approved bending machine is used for this purpose. In the case of the large size conduits, l' and over, the elbows or offsets made by the manufacturer should be used unless special permission is obtained from the Architect-Engineers, to make the bends at the building. No pipe bends shall be made in bench vises and any conduit bends or offsets in which

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pipe is crushed, deformed or otherwise injured shall not be installed. The inside and outside radius of all bends and offsets shall be smooth and free from irregularities. Minimum radius xxxixx of bends to be eight times radius of conduit.

X. The Contractor shall install bushing and lock nut at the end of each conduit at panel cabinets and at all outlets. The Contractor shall also plug each conduit was with cork or wooden plug as soom as the conduit is installed, to prevent its filling with plaster, dust, etc., and to avoid condensation therein.

L. The maximum length of any branch circuit conduit run shall not exceed 150 ft. including two 90° bends. For runs over 150 ft. pull boxes shall be installed. For lengths over 500 ft. suitable slip type of expansion joints shall be installed.

M. All bushings for conduits larger than 1" shall be of the approved type provided with set screws. All bushings shall be insulated approved type.

N. All feeder and branch conduits shall be rum in a concealed or exposed manner.

2. BOXES

- A. All boxes, fittings, etc., shall be galvanized.
- B. Therever it is found desirable during the installation of the conduits, the Contractor shall provide and install suitable approved pull boxes to facilitate the insertion of the conductors. The pull boxes shall be made of sheet iron not less than No. 12 gauge. The covers of the pull boxes shall be secured in position by means of screws, and must be so arranged as to be readily and conveniently removed. The pull boxes are to be painted inside and out with rust preventative paints
- C. At various points where indicated on the plans, junction outlet boxes are to be installed for making branch connections to the circuit work. Suitable outlet boxes are to be provided at these points of ample size and provided with a flat cover similar to a switch plate.
- p. The Contractor shall furnish and install suitable galvanized outlet boxes for all types of outlets in connection with the electric work throughout the entire building. All ceiling outlet boxes are to be placed flush with the lower surface of the finished, furred, or hung ceilings, and all side outlet boxes are to come flush with the wall finish.

E.All outlet boxes for light service shall be furnished with fixture stude, and boxes shall be securely supported and furnished with hangers to properly take the weight of the fixtures. For extra heavy fixtures, furnish special iron pipe supports as approved.

F. All outlet boxes for outside use shall be of the marine or weatherproof type such as manufactured by Russell & Stoll, Crouse-Hinds Company, Appleton or satisfactory equal as approved by the Architect-Engineers.

- G. All panels, entlet connections, etc., are to be furnished with lookmuts, bushings, etc.
- H. Where gang switches or receptacles are used, use special gang boxes. All boxes of all types shall have moisture-proof covers.

3. SWITCHES

- A. Provide and set at the place designated on the plans, the various flush on surface mounting switches, the details of their installation shall be subject to the approval of the Architect-Engineers. They shall be of toggle type, not less than 10 Amp. 250 Volt rating of type manufactured by Mart and Hegeman, Mubbel or approved equal. Exact pattern switch discharge proposed that when shall be approved by the Architect-Engineers.
- B. Where one, two or three switches are grouped together in a "gang" a single face plate may be used. Where more than three switches are located at one point, the face place may be used in multiple of three.
- G. The Gentractor is notified that where the location of switches are indicated on the plans to be installed at or near the doors, the definite location will depend upon and may be influenced by changes in the location, arrangement or swing of the door. All switches shall be located on the strike side of the door.
- D. The Contractor shall cooperate with the Architect-Engineers and note any and all such changes in the said arrangement or swing of doors before proceeding with the installation of any switches. Obtain Architect-Engineers instructions on exact heights at which switches are to be fixed
- E. All switch esver plates to be not less than .06" in thickness. Finish of all cover plates to be as directed by the Architect-Engineers to match other hardware. In bathrooms and shower rooms provide brass face plates with rubber gaskets to exclude surface moisture from entering switch box. Fixish chrome plates.
 - F. Provide three and four way switches where required of manufacture as above.
 - G. All switch covers except as specified above shall be of meisture-proof type.

4. BASE AND FLOOR RECEPTACLES

- A. This Contractor shall furnish and install all local flush receptacles, or surface mounting receptacles, of both single and daplex type, as indicated on accompanying plans and herein called for, to provide plug-in outlets for electric equipment. He is to furnish and install these receptacles with galvanized outlet boxes and covers, cover plates to be not less than 0.060" in thickness. Plates to be place horizontally above baseboard unless otherwise directed. Finish of all plates to be as directed by the Architect-Engineers to match the hardware. All sever plates to be noisture proof type.
- B. Where indicated on plans said receptables shall have control switches and jewelled pilot lights of general pattern similar to N & N #5552. Rating of these receptables to be as indicated. Cover plates to be as herein before specified.

- Co Furnish insertion plugs of sufficient number to equal 25% of the total number of receptable Outlets actually installed.
- Do Receptacles shall be composition, 10 ampere, 250 wolt, T slot type, top wired or of duty indicated. The general receptacle outlets are to be placed just above the base except where otherwise indicated on drawings.
- E. Where indicated on Drawings 3 pole receptacles shall be furnished. These receptacles shall be rated as shown on the Drawings. The third pole is to serve for the equipment ground wire and the equipment supplied from these receptacles is to be provided with 3 wire line cords.
- F. Floor outlets of flush mounting protected type with hinged covers shall be furnished and fixed where indicated. These outlets shall be 10 ampere 250 volt rated, unless otherwise shown. To be type manufactured by Russell & Stell or approved equal. Exact pattern it is proposed to use to be submitted for the Architect-Engineers approval.

5. BUSDUCTS

- A. Furnish and install industrial type Busducts where indicated on Drawings. These shall be of 225 Ampere 250 wolt rating, 5 phase, 4 conductor, plangin type similar and equal to Flex-A-Power type manufactured by Trumbull Electric
 Co. To be complete with all fittings, elbows, supports, endcaps, joints, feed
 boxes clips and fixings, etc., as required.
- B. In conjunction with this Busduct furnish plug-in type, three pole and solid neutral thermal circuit breakers similar and equal to type "FEC" Flex-A-Plugs with type AT breakers as manufactured by Tmumball or equal approved. These devices shall be of same manufacture as the Busduct to ensure proper matching and fit. They shall have an external operating mechanism to in-disate for "off" and "tipped" positions with handle arranged for either hook stick or cord operation. Rating of breakers to be as indicated on Drawings.
- C. Furnish and install branch circuit Busducts where indicated on Drawings. These shall be of 50 ampere, 250 volt rating, 3 phase 4 conductor plugin type similar and equal to type LTG Flex-1-Power as manufactured by Trumbull Electric Co. To be complete with all fittings, feed boxes, and caps, supports, clips and fixings, etc., as required.
- D. In conjunction with this branch circuit busduct, furnish all required plug-in devices which shall be of the two pole polarized type equipped with fusable attachement plugs containing 15 supere glass tube type fuses. The polarity of the devices shall be visible after the device has been plugged in.
 - E. All this equipment shall be of standard N.E.C. approved manufacture.

SECTION NO. 3 - FEEDERS, CIRCUITS AND WIRING IN GENERAL

1. PERDERS

- A. Furnish and fix all feeders from Unit Substation to distribution power and light panels as indicated on Drawings and schedules.
- B. All feeders shall be run conscaled or, in special locations as indicated herein before, exposed. Include all pull boxes of adequate size, fixings and fittings as herein before specified.

2. BRANCH CLRCUITS

- As Branch lighting circuits shall consist of #12 guage conductors in galvanized rigid conduit, run concealed from panelboards to each and every outlet, terminating in approved galvanized then outlet boxes. No more than 12 outlets shall be placed on any branch circuit.
- B. Branch circuits for heavy duty receptacles and other heavy duty outlets shall be of sizes as indicated on the Drawings.
- C. Coneral arrangement of circuits to be as indicated diagrammatically on Drawings.

3. JOINTS AND SPLICES

- A. The splicing of wires concealed in conduit will not be permitted. There may be a necessity for a splice, upon the Architect-Engineers permission, a junction box with cover may be used and the wires are to be soldered and covered with rubbar compound and them with an outer covering of friction tapes alternately Bundy connectors may be used in these locations. Junction boxes must be enameled on the interior with an approved damp resisting paint, and shall be moisture proof.
- B. All high and low tension taps and splices are to be carefully soldered and taped. All low tension connections, where made to apparatus or terminals are to be soldered.

4. WIRING IN GENERAL

- A. This Contractor shall furnish and install the wiring system complete including High Tension Wiring, and all secondary connections from Unit Substations to distribution boards, feeders, branch power and light circuits, special circuits, etc. Also communication systems of all types specified hereinafter and all special wiring herein called for or shown on Drawings, etc.
- B. All wire shall be of the HH type and shall conform to the rules and regulations of the National Board of Fire Underwriters.
- G. This Contractor shall leave a sufficient loop of wire at each light outlet with proper tags for the future connecting of light fixtures, and at each low tension outlet for proper connection to electric specialties.

- D. No branch circuit wiring shall be smaller than #12 gauge. Other sizes to be not smaller than indicated on plans for feeders and special service, am in all cases to be not less than the Underwriters requirements.
- E. Mains for lighting shall be three phase, four wire with two wire branches and mains for power shall be three phase, three wire except as noted.
- F. Mains in panels, pull boxes, switchboards, and similar locations shall be furnished with an additional outer asbestos covering.
- Go White colored insulation to be used for neutral, black for service lines and branches, and red or other colors for special service as directed. The other surface of the insulation is to be clearly marked approximately every two feet, giving the size, type and voltage of the wire and also to contain the manufactureres name.
- H. Approved make of wire is that marked "Improved" "Fire-Stop" "Safecote" as furnished by National Electric Products Corp., Anaconda Wire & Steel Co., General Electric or equal.
- I. Balance all light and power loads as evenly as possible across the three phases of supply.

5. POWER WIRING

- A. This Contractor shall farmish and install all wiring and connections of all motors, controllers and power apparatus even if such apparatus is supplied by others.
- B. Suppliers of all such apparatus shall furnish and set their apparatus and controllers only. This Contractor shall carry out all wiring, conduct work and commections/to string diagrams supplied by and as required by apparatus manufacturers.
- 0. Such wiring shall be of sizes and gauges and types as required by each manufacturer and to Code requirements, also to details shown on drawings.

6. GROUNDING

This Contractor shall provide suitable grounding as required by the Mational Electric Code for the neutral of the low voltage system, the frames of high tension equipment, as well as the frames of motating machines. Connections to the water mains for grounding the incoming service shall be made on the atreet side of any water meters installed.

7. REMOTE CONTROL WIRING

Furnish and install all remote control wiring required in connection with all electrical apparatus and motors whether said apparatus and motors are supplied by this Contractor or not. In general the remote control stations shall be supplied by the particular Contractor supplying the Electrical apparatus or motors.

SECTION NO. 4 - SERVICE SUPPLY

1. GENERAL

This Contractor shall furnish install and connect ready for operation the 15,000 wolt high tension feeder system, and 480 wolt and 208/120 wolt power and lighting systems, including the unit sub-stations for lighting, and power. Include the cost of the installation for the potential and current transformers and the Kowahr, meter in a compartment supplied for this purpose in the high tension equipment by this Contractor. The metering equipment will be supplied by others.

2. SERVICE ENTRANCE

- A. This Contractor shall furnish and install a complete high tension service entrance feeder from a pole located on the property line on the South side of the building where indicated.
- G. The cable from the pole shall be protected by a suitable weather-head and a disconnect switch and a lighting arrester. The disconnect switch shall be of type equal to General Electric Co. manufacture. The lightning arrester shall be of three pole Thyrite type equal to General Electric Co. catalogue 91A1G27 with preper grounding conductor run down the pole, and fastened there to, and commented to a grounding electrice installed one foot below moisture level. Conductor to be run in 1 galvanized conduit for a height of at least 10 ft. above street level.
- D. The length of the required entrance cable is estimated at 300 ft, of which approximately 250 ft. will be buried in the trench. This Contractor in his bid is to submit a price for every 10 ft. more or less cable that will be actually required as determined from measurements at the building site when the exact Public Service Company's pole location has been established.

5. HIGH TENSION SWITCH CEAR

A. This Contractor shall furnish and install the high temsion switch-gear in position indicated on the Drawings to details below. For the purpose of setting a standard, figure numbers given refer to apparatus of General Electric Company's manufacture. Switchgear of other equal approved manufacture, such as Westinghouse etc:—will be acceptable. Full details of the gear proposed to be installed shall be submitted to the Architect-Engineers for approval before ordering as hereinbefore specified.

Bo Switchgear to be to following details:-

To comprise one indoor type MI-5 vertical lift metal clad switchgear for the control of the following apparatus or circuits arranged for operation upon an ungrounded system rated 13800 volts, 3 phase, 3 wire, 60 cycles.

- 1 Incoming line
- 2 Teeders

Unit No.

The units when viewed from the circuit breaker control switch and operating mechanism side of the structure shall be arranged from left to right in a continuous row as follows:

2 2 Feeder units 2 1 Power Co's Metering unit 1 1 Incoming line power circuit breaker unit 1 Set of metal clad accessories

Equipment

The switchgear equipment covered by these specifications shall be designed, tested and assembled in accordance with rules of the AJA, NIKE and NEMA where applicable.

The power circuit breakers in the metal clad units shall be magne-blast type rated 1200 amperes, 15, 350 volts, 250,000 KVA interrupting rating. They shall be electrically sperated with AC solenoid rectifier closing mechanisms and AC trips including closing relay, operation counter and auxiliary switch. The breaker housings shall be provided with manually operated removable breaker elevating mechanisms.

All copper bus; connection bars, necessary auxiliary and ground buses; and structural supports required for the switch-sear covered by these specifications shall be completely fabricated and assembled at the factory.

Material of panels shall be 1/8" specially leveled steel.

The front and rear of metal panels and the exteriors and interiors of all metal structures shall be given a suitable rustresisting priming coat and a finishing coat of quick drying lacquer. The color of the front of panels and the exteriors of structures shall be blue gray and the back of panels and interiors of structures shall be light gray.

Instruments, meters and relays shall have dull black finish.

Indicating instruments shall be semi-flush type with suitable scales.

Relays shall be semi-flush drawout type with built-in testing devices.

Scales for indicating instruments shall have white background with black marking.

The panels and shipped assembled equipments included in these specifications shall be completely wired at the factory and shipped ready for installation and connection. All groups of wires leaving the panels and shipped assembled equipments will be provided with terminal blocks correctly numbered with numbering strips.

Card holders and/or nameplates shall be provided where necessary.

Unit #1:

1- Incoming Line Power Circuit Breaker Metal Clad Unit

Pating: 15,500 volts, 1200 (max) amperes, 3 phase, 3 wire, 60 cycles, trip set 100 amp.

Equipment:

- l- Hinged panel
- 1- Indicating ammeter, 5 amperes with suitable ampere scale
- 1- Power circuit breaker control switch, type SB-1 with indicating lamps with red and green color caps
- 1- Ammeter transfer switch
- 3- Relays, overcurrent, drawout
- 1- Power circuit breaker, type AM-15-250, TPST 15000 volte, 1200 amperes 3- Current transformers, 200/5 amperes at the
- 1- Three phase insulated bus with necessary supports
- 1-3 conductor pothecd

Necessary insulated interconnections for above equipment and buses.

Small wiring and terminal blocks with necessary auxiliary and ground buses.

Unit #2:

1- Power Company's Metering Unit (To meet requirements of Public Service Co.)

Rating: 15,500 volts, 1200 (max) amperes 3 phase, 3 wire, 60 cycles.

Equipment:

- 1- Himsel panel
 Provision for mounting Power Co's meters, potential
 transformers, and current transformers
- 1- Three phase insulated bus with necessary supports

Necessary insulated interconnections for above equipment and to adjacent unit.

Small wiring and terminal blocks with necessary auxiliary and ground bus.

Units 3 & 4:

2- Feeder Metal Clad Units

Bating: 15,000 volts, 1200 (max) amperes, 3 phase, 3 wire, 60 cycles, trip set 60 amp each.

Equipment per unit:

- 1- Hinged panel
- 1- Ammeter, type AD-7, 5 amperes with suitable ampere scale
- 1- Power circuit breaker control switch with red and green indicating lamps
- 1- Ammeter transfer switch
- 3- Relays, overcurrent, drawout type
- 1- Power circuit breaker, type AM-15-250, TPST 15000 volts, 1200 amperes
- 3-Current transformers 200/5 amperes
- three phase insulated bus with necessary supports
- 1-3 conductor pothead

Nacessary insulated interconnections for above equipment and buses.

- 1 Set of Accessories, consisting of:
- 1- Testing cabinet for wall mounting
- 1- Manual maintenance closing device
- 1- Set Control jumpers
- 1-Test plug less cables for drawout relays
- C. This switchgear shall be designed to operated at an altitude of \$5.00 ft.

4. HIGH TENSION FEEDER

A. The entire Stadium will be supplied by a high tension two branch radial feeder system at 13 K.V. from the high tension switchgear specified in Article 3 above. This system shall be furnished and installed in its entirety by this Contractor.

B. This feeder shall consist of a three-wire #6 park-way cable rated at 15,000 wolts RMS AC to meet the Specifications as given below:

Cable shall be laid in a 30" deep trench in the same manner as specified for service entrance cable. The trench shall be kept away approximately 10 ft. from the outside building walls...

- C. At the corners of the building where indicated on drawings the four (4) unit sub-stations as specified hereinafter are located. The cable shall be brought in and out again at the South East and South West corners of the building and in only at the North East and North west corners.
- D. At the two South corners the cable shall be looped through on the disconnect switch bus at the 13 K V side of the unit sub-stations.
- E. Inside the building each upward or downward sable riser will be run and fastened against the outer building wall in a transite odnduit of sufficient inside diameter to be slipped over the cable.
- F. Details Specification for the cable is as follows. For the purpose of setting a standard figure numbers given refer to cable of General Electric Co's manufacture. Cable of other equal manufacture such as Okonite will be accepted subject to Architect-Engineers approval before ordering. Cable shall be Parkway cable, 3 conductor #1799 VC insulated type H nozzle-swirl processed lead sheath type TFJ galvanized steel tape armor cable rated 15KV and constructed in accordance with insulated Power Cable Engineers Association Specification latest edition.

5. UNIT SUBASTATIONS

A. This Contractor shall furnish and install complete the four 15KV/208-120 volt, 3 phase unit sub-stations located on the four high level mezzanines as shown on Brawings.

B. Each sub-station shall meet the following Specification:

The sub-stations will have the following self-cooled rating in accordance with the Standards of the A.J.R.K.

Unit Substation Will Consist of the Following Co-ordinated Parts:

One Incoming Line Section with

- 1-- Pyranol-filled interrupter switch, two-position, "Openclosed," mounted directly on the transformer. The switch will be suitable for making and breaking the magnetizing current of the transformer. Suitable key interlocking with the low voltage air circuit breakers will be provided so that the switch cannot be opened or closed with load on the transformer.
- 2- Potheads, mounted integral with the switch arranged for looping one three-conductor cable in and out of the junction box from below.

One Transforming Section with

Three-phase, self-cooled, Pyranol-filled transformer in accordance with the applicable sections of Standards C-57.1 of the ASA.

Rating: 300 KVA (55°C) -- 60 cycle
High voltage, 13,800 delta-Low voltage, 120/208Y.

Four approximately 2% rated KVA capacity taps in the high voltage winding, two above and two below rated primary voltage, brought to externally operated manual tap changers which are to be operated only when the transformer is deenergized.

Standard accessories to be furnished These will include:

Prain valve and sampling device
Filling connection
Filter press connection
Jack Bosses
Thermometer
Liquid level gage
Sampling device
Relief diaphrage
Lifting lugs
Cover lifting eyes
Pressure test connection and a r vent
Ground lug

Two transformer base construction will be of the fabricated type and suitable for using rothers or skidding in any direction.

The low-voltage bushings and transition will be properly coordinated for field connection to the low voltage switchgear section.

One Low-Voltage Feeder Switching Section with

- 1 Indoor-type, metal enclosure with hinged front doors, removable rear plates, bare copper buses and provision for bolting to the transformer section in the field to form an integral unit. The following equipment will be mounted in this section.
- 1- Main transformer secondary air circuit breaker type General Electric AL-2-50, rated 1000 amp, 600 volts, 50,000 amp interrupting rating, TPST, drawout type, manually operated, with adjustable time overcurrent protection, instantaneous short circuit trip.
- 2- Feeder air eircuit breakers, Type General Electric

 AE-1-15, each rated 225 amp, 600 volts, 15,000 amp interrupting rating, TPST, drawout type, manually operated,
 with adjustable time over-current protection, instantaneous short-circuit trip and clamp type cable terminelso
- 1-- Bitto magnetic type breaker electrically operated
 - 1- Air circuit breaker, Type General Kleotric A2-1-25, rated 600 amp, 600 volts, 25,000 amp interrupting rating, TPST. Each space will include hinged front door, housing, bus, and stationary disconnecting devices. The removable circuit breaker element and carriage is not included.

The above drawout flow voltage air circuit breakers will allow on the policy in the book which proving the breaker when the of in the closed spection, manual trip button, external target for visual indication of breaker position, are quenchers, and insulated closing handle for menually operated breakers.

- G. This Contractor shall furnish and install complete the Unit substation on the equipment room on the Arena floor in position indicated on Drawings.
 - D. This Substation shall meet the following Specification

The substation will have the following self-cooled rating in accordance with the Standards of the A.I.E.

The Unit Substation Will Consist of the Following Co-ordinated Parts:

One Incoming Line Section with

- l-- Pyranol-filled interrupter switch, two-position, "Openfilosed," mounted directly on the transformer. The switch will be suitable for making and breaking the magnetizing current of the transformer. Suitable key interlooking with the low voltage air circuit breakers will be provided so that the switch cannot be opened or closed with load on the transformer.
- l--- Pothead, mounted integral with the switch arranged for one three-conductor cable .

Transforming Section with

Three-phase, self-scoled, Pyranol-filled transformer in accordance with the applicable sections of Standards G-57.1 of the ASA.

Pating: 500 KVA (5500)- 60 eyele
High voltage, 13,800 delta-Low voltage, 480Y.

Four approximately 20% rated KVA capacity tape in the high voltage winding, two above and two below rated primary voltage, brought to externally operated manual tap changers which are to be operated only when the transfermer is deemergized.

Standard accessories will be furnished. These will include:

Dadi afo ad caping isiO Bilingamatin

Filter press connection

Jack bosses
Thermometer
Liquid level gage
Sampling device
Relief disphragm
Lifting lugs
Cover lifting eyes

Pressure test connection and air went Ground lug

The transformer base construction will be of the fabricated type and suitable for using rollers or skidding in any direction.

The low-voltage bushings and transition will be properly coordinated for field connection to the low woltage switch gear section.

One Low-Voltage Feeder Switching Section with

- 1- Indoor-type, metal enclosure with hinged front doors removable rear plates, have copper bases and provision for bolting to the transformer section in the field to form an integral unit. The following equipment will be mounted in this section.
- 1- Main transformer secondary air circuit breaker Type General Electric AL-8-50, rated 800 amp, 600 volta, 50,000 amp interrupting rating, TPST, drawout type, manually operated, with adjustable time overcurrent protections instantaneous short-circuit tripe
- 5- Fooder air circuit breakers, Type materal Electric AK-1-15, each rated 825 amp, 600 volts, 15,000 amp interrupting rating, TPST, drawout type, manually operated, with adjustable time over-current protestion, instantaneous short-circuit trip and clamp type cable terminals.
- 1 -- Ditts magnetic breaker electrically operated.
- 2- Spaces for FUTUHS air circuit breaker, Type General Mectric AK-A-15, rated 225 amp, 600 volts, 15,000 amp interrupting rating, TRST. Each space will include himsed front door, housing, bus, and stationary disconnecting devices. The removable circuit breaker element and carriage is not included.

The above drawout low voltage air circuit breakers will all be equipped with safety interlocks which prevent withedrawing or inserting the breaker when it is in the clogged position, manual trip button, external target for visual indication of breaker position, are quenchers, and insulated closing handle for manually operated breakers.

- Lo All these unit substations shall be of type manufactured by General Electric Co., Westinghouse or equal. Architect-Engineers approval of manufacturer selected is to be obtained before ordering.
- F. All this equipment shall be designed for operation at \$500 ft. altitude.

SECTION NO. 5 - POWER AND LIGHT PANEL BOARDS

1. CABINATS

- A. All panelboards shall be mounted in Code gauge galvanized steel cabinets with corners flanged and riveted or spot welded. Cabinets to be flush or surface mounting as indicated.
- B. Cabinets shall be of ample size to accommodate a gutter at both sides, top and bottom of panelboard. Gutters shall be in accordance with capacity of bus-bars, main branch circuit connections of each panelboard.
- C. Cabinets shall be furnished with substantial panelboard supporting stads and from fastening devices. The from fastening devices shall provide a means for adjustably fastening from to box.
- Do Fronts shall be made from a single piece of code thickness, full cold rolled, full pickled and annealed furniture type sheet steel. The door shall be cut out leaving a trim of proper width all around. Door shall be fastened to trim with flush type steel hinges. Fronts shall be provided with a beveled steel return spot welded to the inside of the front to form a rabbet for the door and also to enclose the wiring gutter space between the penchoard face and the front. Doors shall be provided with polished chromium finished catch and lock and a directory frame shall be furnished on inside of door.
 - E. Fronts shall be treated with a rust proofing process such as Bond-erising and then finished in pearl gray lacquer or other solor as selected by the Architects Engineers.
 - To After the cabinets have been installed and before the wires have been unliked to, the configuration shall thoroughly obtain the limite of the cabinets and plaint the limite of the cabinets and plaint the limit and some cabinets.

2. BRANCH LIGHTING PANKLBOARDS

- A. Furnish and install where shown on plans circuit breaker branch lighting panelboards mounted in steel cabinets supplied by Bull Dog Electric, Trumbull Electric, Westinghouse, or equal approved make.
- B. The panelboards shall be of the dead front type and shall be equipped with automatic branch circuit breakers for eac. branch circuit. Circuit breakers shall have trip elements of not less than 20 amps. and shall have trip elements when feeding circuits of greater capacity as indicated on the plans and schedules.
- C. The branch circuit breakers shall have both thermal and magnetic, automatic trip. Thermal trip shall have inverse time limit feature preventing circuit breaker tripping on momentary overloads. Magnetic trip shall provide instantaneous trip on short circuit. Breakers shall be quick break of contacts when manually operated or when automatically tripped. The circuit breaker operating mechanism and handle shall be trip free and non-closeable

on overloads preventing contacts from being held in closed position against abnormal overload or short circuits. Automatic tripping shall be indicated by the breaker handle assuming a clearly distinctive position from the manual "on" and "off".

- D. Each circuit branch shall be distinctly marked on face of circuit breaker giving capacity of breaker and number of the circuit controlled. Unless specifically called for otherwise, bus-bars for each penelboard shall be equipped with main lugs only, the capacity of which shall be determined by the feeder size. Neutral bus-bar taps shall be numbered corresponding to switch numbers, and branch circuits shall be correspondingly connected. All breakers shall be approved by Underwriters Laboratories Inc. and shall bear their labels.
- E. Panel bus-bars shall be for three phase, four wire service, unless otherwise shows on plans.

3. BRANCH POWER PANELBOARDS

- A. Furnish and install, where shown on plans, circuit breaker panelboards, dead front safety type, mounted in steel cabinets, for the distribution power feeders. They shall be of types furnished by Westinghouse, Common Electric, Buil Dog Trumb Adams Electric Co., or equal.
- B. Mains shall be provided with lugs only except where main breakers are repecified on schedules or drawings.
- C. Branch circuit breakers shall be single or three pole, as indicated. Breakers shall have inverse time limit characteristics so that tripping will be prevented on momentary overloads. Automatic tripping shall be through bimetallic thermal trip element engaging the releasing latch of the common trip machanism, and correlate or any pole shall tripped poles of the breaker similar ancessary. Breakers shall be qualched, and because of the breaker similar allow contacts, brite breakers that be enclosed and sealed to prevent tampering. Breakers shall be operable in any position and handle shall clearly indicate whether breaker is "off" "on" or tripped automatically.
- D. All circuit breakers above 100 ampere capacity shall have removable trip elements. All breakers of 100 ampere or less shall have permanent trip elements. All breakers shall be approved by the Underwriter's Laboratories Inc., and shall bear their labels.

4. CABINET KEYS & SCHEDULES

- A. All panel and switchboard keys throughout the premises are to be of one type so that the common key will operate all looks.
- B. Provide and place on the inside of each lighting and power panel cabinet door, a suitable schedule substantially secured by means of an approved metal frame made out on an approved form giving the name of the feeders or mains supplying the group of cutouts in said cabinet and of every main or branch circuit originating at said panel. The schedule is to be protected by means of a piece of clear glass substantially secured in said metal frame.

5. MECHANICAL EQUIPMENT CONTROL DESK

- A. In the Engineer's office in position indicated on plans, this contractor shall furnish and install a control deak to house all remote control push button stations and indicating lights required in connection with the Machanical and Electrical services, etc., throughout the building. This deak shall also house the Multi-point remote reading thermometer for the building heating system, a 7" Loud Speaker from the P.A. system, and indicating pilot lights from the Arena Gas Heating Units. Also an electric clock of size shown.
- B. All equipment to be mounted on the desk required for Mechanical services control shall be furnished by others. This Contractor shall, however, be responsible for comordinating and mounting all equipment amil for the general design and arrangement of the desk. Also for wiring and connecting of all equipment except connections to the remote thermometer. General details of equipment to be housed are given on the accompanying drawings.
- Co The desk shall be constructed of standard code gauge steel, with all necessary supports, stiffeners and fixings, etc., and shell be surface mountaing. To be grey enamel finish as a complete unit after all equipment is mounted. Furnish all necessary connections, wiring, conduit, etc., allowing proper knockouts for all controls. Detail working drawings of deak, and its arrangement to be approved by Architect-Engineers. Deak to be provided with proper size Lamacoid name plates designating each piece of equipment mounted.
- P. This deak shall be supplied by Wastinghouse, Trumbull Mectric Co., ... Bull dog Klectric Products or shall be of equal approved manufacture.



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SECTION NO. 6 - AREA LIGHTING AND CONTROL

1. GENERAL

This Contractor is required to furnish and install complete the Arena Lighting and Control system with all fixtures etc: to details given below. For the purpose of clarification of intention, descriptive specifications are given for certain sections of the system.

2. ARENA FLOODS

- A. There are at present one hundred and forty four 144) flood lights supplied in four groups from the 225 amp, 3 phase, 4 wire busduet feeders. From the four feeders twelve 3 phase, 5 wire, 50 amp rated branch circuit busduets, each supplied through a 70 amp, 3 pole solid neutral breaker, are taken off. These breakers at the high altitude involved will be de-rated and therefore no breakers of lower ratings are permitted under any circumstance.
- Bo Each flood light will be supplied through a flexible cord of sufficient length furnished at its end with a fused and polarized "Elmenco"
 plug of 15 amp rating to be plugged into the 50 amp branch circuit bushuct.
- Co Floodlights are to be General Electric Co. L-69 or approved equal medium beem mounted alongside a 4" angle iron rail on the catwalk at high level in the Arena in the manner indicated on Drawings.

5. BOXING HING FLOODSLICHTS

As මිටුවේ? මාතුම් (CV) මිටුවේ? මෙය මෙන් විවුවේ? මෙන් මා මාර්ඩාවේ ගැන දුදුව ලබනම් කරවුම් රාජ්වමණ වැඩිම සැකි මේ මේ ලොකතු මම (CV) එලබන ගෙනුම මෙනුවේ

- B. The flood lights are to be of the same type as specified for the Arena in ADOTION NO. 6, Article &C herein but of the narrow beam type.
- C. The supporting structure is to be constructed as indicated on the detail Brawings, and is to be supplied and identalled by this Contractor. Before construction a working Drawing is to be submitted for approval to the Architect-Engineers.
- Do Also to be submitted for approval before construction is a hoisting and lowering gear for this structure. This is to carry the lead of the two hoisting cables perpendicular to the walking surface of the catwalk. An outline of the gear required is shown on Drawings.
- L. The electric supply to the floods is to take place through two four (4) conductor #4 flexible cables fed from two 5 pole, 4 wire, 60 amp. Russell & Stoll Beceptacles and Plugs as shown on Drawings.

4. ARRNA SEATING LIGHTS

A. The seating lights will be wired and circuited as shown on Drawings. Approximately half of the seat lights are tied in with the regular lighting system, the other half with the emergency system assindicated.

B. Seating lights shall be General Electric - 3-1-66 or approved equal with 300 watt lamps, mounted on outlet boxesses.

5. ARENA SPOT LIGHTS

A. The narrow beam spot lights will be wired and circuited as shown on Drawings. They will be fed through a separate three phase, 4 wire circuit. Each spotlight will be controlled from its own 15 amp, 250 volt 3.P. circuit breaker located in a box directly below the spot light. Circuit breaker to be manually knob operated.

Bo The spotlights are to be General Electric Co. L.69 or approved equal, narrow beam suitable for the purpose and mounted on an angle iron bracing as shown on Drawings. In addition each spotlight shall be provided with a handle that will enable the operator to swing the light within horizontal, and vertical raddi of approximately 120°. This Contractor is to submit a proposal Drawing of the arrangement for approval to the Architect-Engineers.

6. ARENA FLOOR LIGHTING CONTROL

- A. Each of the four areas flood light feeders is to be controlled from three single pole solid neutral 200 amp electrically operated mechanically held. Contactors for non-inductive loads, 4500 type 930 or equal.
- B. These contactors are to by the killed in the contact panels (97950)

 147-2, GF-3, and G-7-4, Each contactor up to be emblateduably separate

 according to panel (167) push button control aviation on the control deak locate

 ad on the catally control platform in position indicated on Drawings.
- G. These control push-buttons are to allow for operation of each one of the 3 phases of the four (4) flood light feeders individually, so as to obtain a certain degree of dimming effect when each bank of twelve (12) flood lights is distributed evenly over the three phases.
 - P. Master controls are also to be supplied to make it possible to:
 - (1) Light up or extigguish all flood lights on any one of the three phases together.
 - (2) Light up or extinguish all of the one hundred and forty-four (144) flood lights.
- E. The control wiring for this system is only shown partially on the wiring diagram. This control wiring shall be run under or alongside the catwalk structure and consist of the required number of #14 type R wires in conduit, sizes to admit the required number of wires in accordance with the Mational Electric Code. The conduit system shall be supplied with at

least one pull box of sufficient size for every 150 ft. of straight runs or for every 100 feet when bends are inserted in the runs. No splices will be allowed in the control wiring.

7. BOXING FLOOD DONTROL

The twenty-four (24) hoxing flood light controls will be manually operated from the two (2) circuit breakers on the catwalk structure in the proximity of the control platform as indicated.

8. ARKNA SEATING LIGHTS CONTROL

- A. The Arena seating lights fed from the regular lighting system will be controlled by four (4) 3 pole electrically operated mechanically held type 909 ASOO or equal. Contactors of 30 amp rating mounted on a separate bus in the four control panels C.P.I. to C.P.4. located as indicated on Drawings.
- B. These four contactors are to be operat d by four "On" and "Off" push-buttons all mounted on the control desk on the control platform.
- Co On this control desk will also be installed a master "On" and "Off" push-button control emabling the operator to light up and extinguish all these seating lights together.
- D. A similar and identical system of control is to be furnished for the seating lights supplied from the emergency lighting panels with the following addition. The master control for these lights is to be parallelled with a second "On" and "Off" push button with pilot lights installed at a building entrance location on the Arena floor to be used by the maintenance and cleaning crew exclusively. Position of this second control to be as indicated. It is to be key operated and four keys are to be supplied with ite

OMESECUL MENTERS GOVERNOT

The eight spotlights are to be operated by their respective protective circuit breaker knobs, by individual operators when in use.

10. CONTACTOR PANELS

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A. This Contractor is to supply and install on stanchions at each corner of the catwalk as shown on Drawings four contactor panels CPITOCP4 containing the following items:

3 Single pole SN ASCO contactors 200 amp Type 900
2 Three " " " " " 30 amp Type 909
2 " " " Thermal circuit breakers 20 Amp 250 volt
1 " " " " 70 Am 250 volt

This 70 amp breaker occurs only on control panels CP-2 and CP-3. On C.P-1 and CP-4 it is replaced by a 20 amp, 3 pole breaker CP-3 & CP-4

In addition to the above the contactor panels/are to contain sufficient space for 3 more single-pole SN ASCO contactors, of 200 amp rating.

B. These panels shall be of similar general type to the Branch Panel-boards specified hereinbefore and shall be enclosed in cabinets also of types specified hereinbefore. Remote control switches shall be of ASCO #909 and 920 electrically operated and mechanically held single coil type or equal. Branch circuits shall have breakers of types hereinbefore specified. Panels shall be manufactured by Westinghouse, Trumbull, Bull Dog Electric Co. etc; or equal approved. Exact design to be subject to Architect-Engineers approval.

11. ARENA LICHTING CONTROL DESK

- A. A control deak with door and lock of recognized manufacture such as Trumbull Electric Company or approved equal shall be supplied for the Arena lighting.
- B. It is to be manufactured of standard #16 gauge furniture steel of grey finish and shall contain the following controls.
 - 12 Push buttons for Arena Floods as specified under SECTION NO. 6, Article 6(B) herein.
 - Master push-buttons and relays for individual phase control as per SECTION NO.6, Article 6(D)(1).
 - Master push-button and relays for simulteneous operation of all Arena flood lights as per SECTION NO.5. Article 6 (D)(2).
 - 4 Push-buttons for Arena seat lights as per SECTION NO.6, Article 8(B).
 - Master push-button for simultaneous operation of the above lights as per SECTION NO.6, Article 8(0).
 - 4 Push-buttons for the Arena seat lights on the emergency circuit as per SECTION NO. 6, Article 8(D).
 - Master push-button for simultaneous operation conserved as per SECTION NO. 6, Article 8(D).
- 0. All push buttons as enumerated in the above are to be properly identified as to function, and location of lights with engraved lamacoid name plates mounted directly below the push button.
- Do The entire arrangement of the desk is to be submitted in proposal Drawings to the Architect-Engineers for their approval, before any manufacture is commenced. Full wiring diagrams and wiring arrangements within the desk are also to be submitted. The desk shall be arranged for proper conduit and wiring connection having regard to its location.

SECTION NO. 7 - GENERAL HUILDING LICHTING AND POWER

1. GENERAL

- A. This section of the Specification is intended to indicate the method of supply for the lighting and power system throughout all sections of the building other than the Arena proper.
- Bo General materials etc: to be used for this section of the work shall be as hereinbefore specified, and this Contractor shall completely install the lighting system, including fixtures etc:—all as indicated before and herein.
- O. The bottom of all light and power panel boards shall always be installed at a multiple of 8" from the floor in accordance with architectural wall and column features.

2. GENERAL LIGHTING CONTROL

- A. The feeders for the general lighting and power panels in each of the four sections of the Stadium are supplied from a 225 ampere, 3 pole breaker on the unit substation in that particular section.
- B. These breakers are of the magnetic type energized from the unit substation busses which will be alive at any time as long as the main breakers are kept in the "On" position.
 - C. These magnetic breakers are to be operated as follows:

Mach individual breaker from an "On" and "Off" push button with 2 wildt inghts on the Engineers Office control desk.

B. LICHTING FIXTURE SCHEDULE

- A. This Contractor shall furnish and install complete with lamps as specified all fixtures as scheduled below:
- B. All fixtures are marked by type numbers on the Drawings and on the fixture list below. The type of fixture to be used is specified by manufacturers catalogue number. This catalogue number is to serve as a guide only, and this Contractor is permitted to include in his bid fixtures of other manufacturer's, provided that the fixtures comply with all Code requirements as hereinbefore specified, and carry the required labels, and meet with the Architect-Engineers approval.
- C. Finish of all exposed work on all fixtures shall be as required by the Architect-Engineers to suit general hardware finished. This Contractor shall submit three sets of detailed illustrations or outs of each fixture for approval before ordering same. In addition, samples of the proposed fixtures shall be submitted for Architect-Engineers approval if required.

D. This Contractor shall do all wiring and testing of fixtures and cleaning after installation. He shall beeve the installation in proper working order to the Architect-Engineers satisfaction.

FIXTURE SCHEDULE

No.	Migo	Туре	Lemp Size	Romarks
		Catalogo	10	
A	W-1 RIM Benjam			Ceiling Mounted
В	Wal RIM Benjam:	in Cat.#764	12 150	Stem Hounted
a	W-1 Hill Benjam:	in Oat.#964	u 100	Stem Mounted
D	Philite	Cat.#250		Cailing Mounted
7	Philite	Cat.#250	7	•
	•••	(2/60;12	2-60-120	Ceiling Mounted
G	Philite	Gat.#250 (3/75;14		Cailing Mounted
Ħ	Philite	Cat.#250 (3/100:1	7 5* 3 100 300	Cailing Mounted
-				APTITUE WORLEGG
J	A ppleton	0at。G- 57812	79 47	_
		VIOLE	75	Commercial Vapor Tight Geiling Mounted
K	Appleton	Oat.G-	109	Vapor Right
	***	#### D701E		Osiling Mounted
L	Appleton	Gat.G. 57812	60	Ceiling Mounted
M	Bare Lamp on Outlet box	Mone	60	Cailing Mounted Pull chain sperated
H	Philite Fluores	cent Cat.# 1600- 248	2 -4 0-100	Ceiling Mounted
P	Philite Fluorescent	Cato#1600 248		Stem Mounted
Q	Philite Fluorescent	0ato#1800 348	3-4-150	Stem Mounted
R	Philite Fluorescent	-348 Cat.#1600	3-40m150	Ceiling Mountai

Fixture No.	Mir.	Туре	Lamp Size	Remarks
S	Philite Fluorescent	Cat.#1600 - 4/48	4-40	Stem Mounted
T	Philite Fluorescent	Cat.#1600 - 4/48	4-40	Ceiling Mounted
υ	Holophane	Cat.#S-2120	150	Stem Mounted
٧	Holophane	Cat.#C-2120	150	Ceiling Mounted
₹	WJ Westinghouse	Cat.#300Watt W ide Spread	300	Wide Spread Ceiling Mounted
Y	Philite Fluorescent	Cet.#800 - 1/48	1-40	Strip Ceiling Mounted or in cove
Z	Spot Incandescent Philite	Cat.1500-1600	150 (R-40)	Ceiling Mounted
AA	Century	Cat.#2270	25	Wall Mounted
BB	Century	Cat.#2270	25	Ceiling Mounted
CC	McPhilben	Cat.#38	300	Recessed in Canopy
DD	Russell & Stoll .	Cat.#4932	60	Wall Mounted
EE	Russell & Stoll	Cat.#7592	1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1	Surface Mounted
FF	Century	Cat.#2271	25	W all Mounted, marked "Women" white letters, dark field
GG	Century	Cat.#2271	25	Wall Mounted, marked "Men" white letters, dark field
HH •	Century	Cat.#2271	25	Wall Mounted, marked "Telephon white letters, blue field
21	Century	Cat.#2271	25	same as HH, with directional arrow, stem mounted
ĸĸ	Century	Cat.#2271	25	Wall Mounted, marked "Police" white letters, red field
NO	TE: When stem	mounting is speci	fied, electrica	

NOTE: When stem mounting is specified, electrical contractor is to accept mounting heights of fixtures to be 8 ft. in enclosures and 10 ft. in open areas.

SECTION NO. 8 - HACERGENCY AND EXIT LIGHTING

1. TRANSFORMER

- A. Furnish and install in the Basement equipment room as located on Drawings a 50 KVA 480 - 208/120 wolt. 3 phase air cooled transformer of type manufactured by General Electric, Westinghouse or equal approved.
- B. This transformer shall be fed from a circuit breaker on the 500 KVA unit substation located in the Basement equipment room. Breaker to be of magnetic type electrically controlled so as to provide for the emergency lighting control as indicated in SECTION NO.7, Article 2 hereinbefore. General arrangement of transformer connections to be as indicated on Drawings.

2. GENERATOR

- A. Furnish, install and connect complete the diesel engine driven emergency generator to following Specification. This unit is to be self starting within a time limit not exceeding 30 seconds, under full load conditions:, so soon as the normal line voltage of the general lighting system drops below 75% of its normal value of 208/120 volts.
- B. Set shall consist of a diesel generator driven alternator with an output capacity of 62.5 K. V. A. (50KW) at 120/208 volts, 60 cycles. This unit shall be the General Motors #40300 with standard equipment, as shown in G.M. bulletin 351-24 (Rev. 11-48), and the additional equipment called for in paragraph C of thesection.
- C. The following additional equipment shall be furnished and installed by this Contractor. A CONTRACTOR OF THE CONTRACTOR
- (1) Hydraulic Covernor (2) Low mounted suction type fan
 - (3) Rear mounted instrument panel
 - (4) A.O. voltmeter, A.C. Ammeter voltage regulator,
 - axeiter rheostat, field switch.
 (5) Starting battery Deleo #8D29-A 200 AH 12 volts.
 - (6) Flexible exhaust connection
 - (7) Exhaust muffler (Mexim M. V. #8) and pipe to outside

Do Furnish and install approved obloid 500 gal. oil tank on Colocradies including black iron vent, fill pipe and box, tank gauge, flaxible couper pipe to engine, etc.

R. The generator set shall carry manufacturers standard at least 90 day guarantee and shall provide two (2) ordinary adjustments during guarantee period in addition to workmanship guarantee.

3. DISTRIBUTION PANEL AND THANSFAR STITCH

- A. The emergency generator shall be supplied installed and connected with a standard distribution panel and transfer switch forming part of the Diesel generator.
- B. The transfer switch is to be of Asco manufacture or equal and contain all necessary under voltage relays and accessories which will make it function properly and automatically start up the generator when the voltage reaches the minimum value as specified hereinbefore.
- C. The distribution panel contains four thermal, 3 pole and solid neutral circuit breakers of 60 amp, 250 volt rating which are to supply the four feeders to the emergency and axit lighting system as shown on the Drawings. This distribution penel and transfer switch is to be delivered completely wired and with all feeders connected as listed ready for operation by the Electrical Contractor.

4. FEEDERS AND PAULES

- A. From the distribution panel four feeders shall supply the emergency and exit lighting panels identified by the letters "MP" in the four sections of the building. The size and conduiting of these feeders shall be as indicated on Drawings.
- B. These emergency panels and feeders are to meet all requirements as hereinbefore specified for the regular lighting panels. The number of circuits required for each shall be as specified on panel schedules on Drawings.

5. CIRCUITING IN GENERAL

The circuiting of the emergency and exitalighting system shall be separate to and lablated from the general lighting system in such manner, that:

- (1) Under normal conditions with normal supply by the Power Company the transfer switch will connect the emergency and exit lighting system to this Utilities Service through the 50 KVA transformer. In this case the emergency and exit lighting system forms part of the general lighting system.
- (2) When the voltage supply by the Power Company drops to 75% of its normal value of 208/120 volt on the second-ery lighting voltage the transfer switch shall function. This will start the diesel emergency generator and only the emergency and exit lights will be kept lighted until the normal line voltage is restored. In this case the transfer switch will automatically be thrown over into the line position and the diesel generator set automatically be brought to a stand still.

6. MIRRGENOY AND EXIT LIGHTS

The emergency and exit lights form part of the general lighting system as indicated hereinbefore. The general types of fixture to be used, therefore, for this system are identical with those specified hereinbefore and are as indicated under SECTION NO. 7, Article 3.

7. CONTROL

- i. The emergency and exittlighting shall be controlled in the regular manuar i.e. at disappearing line voltage. The emergency generator is automatically started by relay action and the transfer switch is thrown from the Power Company's Service to the emergency generator.
- E. In addition, this emergency and exit lighting will also serve as the general lighting for the building maintenance and cleaning crews pherefore, the breaker supplying the 50 KVA transformer to the line side of the emergency unit, installed on the 480 volt unit substation is to be of the magnetic and electrically operated type, and is to be activated by a key operated "On" and "Off" push button with 2 pilot lights installed adjacent to the push button in the entrance described in SECTION NO.6, Article 8(D)
- C. These two push buttons are to enable the maintenance and cleaning crew to light up the entire emergency lighting system in the building. The push button control is to be supplied completely wired and installed, ready for operation even if this control is not shown on the Drawings.

 individually
- P. The keys specified under Scotton NO. 6, Article 8 as being supplied by this Contractor are also to fit this emergency lighting push button control.



SECTION NOTICE TO A TIONS

1. THIEFHONE EXPTY CONDUIT SYSTEM

- A. Contractor shall furnish and install an empty conduit system for telephone service. The empty conduit system shall consist of empty runs of conduit,
 complete with fittings, wall boxes, pull boxes, etc., all arranged as indicated
 on drawings. Empty conduits shall be provided with a galvanized wire for
 fishing in telephone cables in future.
- B. The approximate location of each telephone outlet box is as indicated on plans. However, the exact final locations shall be in accordance with Architect-Engineers' requirements as determined during construction.
- C. Conduits shall be properly capped to keep conduit clear of obstructions and conduit and fittings shall be as hereinbefore specified.
- D. The system generally shall be arranged to suit the requirements of the Mountain State Pelephone & Pelegraph Corp. and shall be installed in direct conjunction with them. This Contractor shall confer with said Company before proceeding with the work.

2. VARSTERN UNION TELEGRAPH CONDUIT SYSTEM

This contractor shall install an empty conduit system for the Western Union Telegraph service. In general this system shall be as indicated on drawings and the general requirements as covered for the telephone system here—imbefore shall also apply to this system.

3. PUBLIC ADDRESS SYSTEM

- A. This contractor shall furnish all labor, equipment and meterial, and perform all operations in connection with the installation of a complete Public Address System as hereinafter specified and shown on applicable drawings, subject to the terms and conditions of the contract.
- B. All major items of equipment such as phonograph, amplifiers, loudspeakers and microphones, etc. shall be the products of one manufacturer, and
 shall be matched to operate as a complete system, and shall be accompanied by
 complete service notes of the manufacturer and drawings detailing all intercommections. The manufacturer shall have successfully completed comparable
 installations and shall maintain a replacement parts division and a service
 division capable of maintaining the system in operation. The equipment shall
 be equal to that manufactured by Radio Corporation of America, whose figure
 and catalogue numbers are given below for the purpose of setting a standard.
- C. Full details of the manufacturer's system it is proposed to use shall be furnished as herein before specified. If requested, items of proposed equipment shall be furnished for test together with suitable test equipment and test facilities, and the bidder shall assume the burden of proving equality to that specified and the cost of conducting required test.

- p. (1) The Sound System shall provide for voice pickup on the Stadium filter or at the control cabinet, amplification of same and reproduction of the amplified announcements with high fidelity so as to be audible and intelligible throughout the entire audience arena.
 - (2) The Sound System shall provide for pickup of a program of recorded music at any microphone location, amplification of same and high fidelity reproduction of the amplified program in the audience arena.
 - (3) The equipment shall be as specified below:

E. Microphones:

- Control Room Microphone: One RCA MI-12081-B microphone mounted on MI-12066 base shall be supplied for desk use. The microphome shall be a pressure operated, dynamic type, 250 ohms impedance. It shall be equipped with a 15 foot cable which shall comment to concealed male plug insert in the shank. Microphone shall be non-directional below 3000 cycles and semidirectional above that frequency. Microphone head shall be shock insulated from the shank and shall be capable of being tilted through am are of 45 degrees forward or back from the vertical position. Microphone shall have an effective output level of - 57dbm at 1000 cycles, with sound pressure of 10 dynes/sq. on; frequency range shall be 75 to 9000 cycles. Microphone cable shall be terminated with Hubbell, 3 pole twist-look male connector.
- (2) Stadium Microphones: Supply four (4) MI 4048-D microphones. Each shall be a pressure-actuated unit having a moving system consisting of a thin molded diaphragm attached to an annular coil assembly. An acoustic circuit shall be coupled to the diaphragm, so proportioned that diaphragm velocity shall remain essentially constant for a constant sound pressure over the frequency range 60 to 10,000 cycles. The ocil shall be placed in the air gap of a magnetic structure and transformer coupled to the microphone cable. The microphone shall comply with the following:

Directional Characteristics - - - - Non-directional Output Impedances (tapped transformer) - - 50/250 ohms Effective output level (.001 Watt, Sound pressure 10 dynes/cm² - 56 dbm

Height (including mounting) - - 42"

Diameter - - - - - - - 2 1/6"

Length - - - - - - - 5 3/8"

Weight - - - - - - 1 1b.

Cable (MI-45 three conductor shielded) - - 50°

Plug (male) - - - - - - - 3 pole Hubbell Twist-Lock-7567

- (3) Microphene Floor Stands: Supply four (4) MI4090 A floor stands adjustable from 3° 8" to 6° 2" in height. Stand shall be adjustable without operating any release mechanism; the up and down operation shall be smooth and looking action shall be positive. Stand shall have a base 12½" in diameter with equalizing projections to assure a firm position on an uneven floor and shall be finished in satim chrome. Weight of stand shall be 33 lbs.
- (4) Microphone Table Stands: Supply two (2) MI4092 desk stands having 42" black and chrome base; height 2 5/8"; 2" pipe thread, weight 4 lbs.
- where indicated on plans, two RCA Rack Cabinets MI-30963A77 furnished overall dimensions of 28" wide, 24 \frac{1}{4}" deep and 77" high. 70 inches of panel space shall be provided in each. Each cabinet shall consist of the following: Base, Frame, Top Cover (ventilating), Rear Door (ventilating), Set of panel mounting angles and side panels. The two cabinets shall be bolted together to form a single unit. The frame joints shall be welded. Each frame shall have cross ties with 28 holes spaced 5/8" apart to which mounting angles are bolted, thus providing flush or recessed panel mounting. The cabinets shall be designed so that standard 19" panels, rack equipment, panel shelves, plug-in shelves and thereof, there shall be mounted the following equipment and controls:
 - (1) Monitor Panel with Monitor Speaker MI-12435, accordian edge 7" cone, velume control and visual indicator meter mounted therems.
 - (2) One ditto to be mounted on the Control Panel in the Engineer's office, but without visual indicator meter
 - amplifiers shall be shelf-mounted in the cabinet.
 Each shall be capable of 16 dbm output. Frequency response of the amplifier shall be plus or minum ldb from 100 to 10,000 cps. The circuit shall have an interstage gain control and balanced frequency compensation control, which shall compensate for both high and low frequencies simultaneously. Control of response shall be about a pivotal frequency of 800 cps, permitting a rising or falling characteristic with a maximum variation of 15db between lows and highs without any apparent change of volume. It shall have a 10 prong plug, built-in

at the end of the chassis. Minimum input level shall be-60dbm (0.001 watt reference); maximum level shall be-24 dbm. It shall have a gain of 44.3 db and noise level of 60.5 db below rated output. It shall be of the plug-in type with a hendle that when lifted, forces and locks the unit into place on the plug-in shelf. The finish shall be light umber gray, hammeroid.

- (4) Priver Amplifier: (1 required) MI-12243 shall be plug-in Type. Unit shall have 30 to 10,000 cycle response plus or minus 17b, and gain of 73 db. The input impedance shall be 250 ohms. The load impedance shall be 500 ohms and the rated output shall be 3 watts at 1.5 per cent distortion of 1000 cycles. The noise level shall be 48 dbm. It shall have good regulation, 2-db drop from no load to full load and 10 db feedback. Dimensions shall be 5 1/8" high, 5 7/8" wide and 13" deep. Tube complement shall be 2-6J7 1-6F6 and 1-5Y30T.
- (5) Power Amplifier: (five (5) required) shall be MI-12245. Amplifier shall be equipped with interlock switch to break the a-c line to the plate transformer when top cover is open, It shall use four 807 tubes im parallel push-pull and have output impedances of 4,8,16,60 and 250 ohms. It shall have a rated power output of 70 watts with less than 5% total RMS distortion, within the frequency range 100 to 7500 cycles. The gain shall be 32.5 db. The frequency range shall be within 1db from 40 to 10,000 cycles. The feedback shall be -14db at 1000 cycles. The power supply shall be 105/125 volts, 50/60 cycles and the zero-signal power consumptical shall be 180 watts. It shall have alongth of 19" depth 11-1/2" helpht 10 1/2" and shall be designed to mount on channels in the rack cabinet. Tube complement shall be 2-637, 4-807, 1-5R4-GY 12-OD-3/VR150.
- (6) Controls: In addition to the preamplifier and driver amplifier controls there shall be five (5) Daven step pads controlling the input to each power amplifier, a level indicating meter, 3 switches to cut-off output to center area speakers, a key operated main power switch, a power pilot light, and 4 toggle input switches, all panel mounted.
- (7) Input Receptacle: A 3 pole Hubbell twist-look female receptacle shall be panel mounted and switch connected to all four input amplifiers. Switches shall permit testing of each preamplifier as well as connecting receptacle to system for program input at the control position

(8) Terminals: Terminal blooks shall be provided with blank terminals for connection of all input, output and AC lines. Internal rack wiring shall terminate on blooks wherever possible and shall be neatly formed with proper isolation of high and low level circuits.

G. Loudspeakers:

(1) Main Stadium Speakers (5 required) shall be RCA MI 6264 twin power, high fidelity loudspeakers. The frequency response shall be smooth from 50 to 11,000 cycles. Distribution angle shall be 55 degrees at 2000 cycles and there shall be uniform distribution within the included angle. The cabinet shall be solidly constructed of wood and shall house two coaxially mounted units. The crossover network shall pivot at 650 cycles. The following characteristics shall apply:

Allowable Power - - - 40 watts complex wave Sensitivity - - - - 63 bars at 1,000 cycle;. Impedance - - - - 15 ohms Cabinet - - - - - wood (water resistant veneer) Net weight - - - - 224 lbs.

Dimensions - - - - 36" x 36" x 36"

(2) Auxillary Speakers: (3 required) shall be RCA MI 1469/1425 PM. Each unit shall consist of a high fidelity permanent magnet mechanism having a 6" diameter, 6" deep cone with a special cluminum voice ooil of 15 ohms impedance and an aluminum throat unit of 4 copening accoustice by coupling the spouker init to an exponential type baffel having a mouth opening approximately 22 soure. The construction of the form shall be of the cellular type in which a cluster of small horns (9) are assembled together into one large horn; at the lower frequencies, each individual cell is to become progressively more independent of the adjacent cells and cover its own distribution erea. The distribution angle of the baffle is to be 60 legrens both horizontally and vertically with uniform intensity at given distances for all frequencies impressed upon the speaker and the tone quality is to be uniform at all points within the specified angle. Fower handling espacity of this loudspeaker shall be 10 watts complex wave and outside dimensions of mouth opening shall not exceed 26" x 23-3/8". Each auxilliary speaker shall be equipped with a multi-tapped matching transformer MI12371 to permit adjustment of power in relation to main speakers.

- H. For use at any microphone location, a record player, RCA MI-4829 shall be provided which shall operate from a 105-125 volt, 50/60 cycle A.C. line with a power consumption of 30 watts. Unit shall be equipped to play 10", 12", or 16" records at 33 1/3 or 78 RPM with a variable adjustment to vary each speed plus or minus 10% and shall be enclosed in a sturdy carrying case 21 1/2" x 19 1/2" with handle, power cord with plug and shielded audic output cable terminated by a plug to fit microphone receptacles. The turntable shall use a crystal type pickup with a frequency response of 70 to 7000: cycles and a compensated type of volume control.
- I. Complete set of spare tubes shall be furnished for all equipment requiring tubes.
- J. All wiring shall be rum in conduit and the installation of all conduit, boxes, receptacles, etc. shall be as hereinbefore specified and as given below.
 - (1) Microphone Lines: All microphone wiring in conduit shall be 2 conductor #18 twisted shielded cable; Bash conductor shall be made up of 16 #30 timeed copper wires.

Insulated with a lacquered calanese serve. Over the celanese serve, there shall be a 2 end, 2 ply waxed cotton braid using \$40 cotton threads. The two conductors shall be color coded, each of a distinctive color and shall be twisted at the rate of 4 turns per foot and shall be enclosed in a tinned copper shield made up of \$34 tinned Copper wire using 4 ends per carrier and a 16 carrier braider. Two of the 16 carriers shall use 4 ends each of bare copper wire producing an identifying spiral tracer. The shielding shall be abraided at the rate of 18 picks per inch. The 0. D. of the cable shall not exceed .20". The wire shall be subject to a voltage breakdown test of 2000 volts, between conductors and between either conductor and the shield.

- (2) Speaker Lines: Wiring from amplifier to each speaker shall be a #14 rubber covered pair in conduit.
- (3) Amplifier cabinet shall be solidly grounded by means of a #10 conductor.
 - (4) Terminals: Near base of all cabinets hereinbefore specified, terminal strips shall be securely mounted, with all wiring from equipment and other controls terminated thereon, and having blank terminals for connection of all incoming lines.
- (5) Interconnecting Wiring: All interconnecting wiring between various units, switching and control equipment, shall be neatly run in each cabinet and shall be shaped into neat wire forms, properly fastened cabinet and terminated on terminal strips. Low level circuits shall be properly shielded and

effectually bonded and grounded. All circuits shall be insulated and circuits of different levels shall be isolated from one another.

E. Furnish and fix a 2" angle iron structure with all necessary bracing to support the Arena speakers as shown on plan. The sights wain speakers are set on this frame as indicated and all speakers are to be supported 7'0" above the level of the catwalk.

4. FIRE ALARM SYSTEM

A. This Contractor shall furnish and install a complete electrically supervised, closed circuit, code-ringing, municipal commetted fire claral system. For the purpose of setting a standard system and equipment of Miwards & Co. manufacture has been specified. Systems of approved equal manufacture may be used subject to Architect-Engineers approval.

Bo This system shall be Edwards SSAE-Type T for use with tripper type; municipal auxidiarized master box. The system shall be so designed that the operation of any one of the fire alarm stations shall sound a coded alarm signal on all the signal devices of the local system and at the same time, trip an auxiliarized box connected to the manicipal fire alarm system, thus transmitting an alarm to the City Fire Department. The coded alarm signal shall consist of a series of single strokes representing the code number of the station operated, four times in all. Two (or Three) digit codes shall be used as directed, the first digit representing the riser, the second and ... third digits the floor of that building. An authorized person with a key may open the door of any station without breaking the glass panel and transmit an alarm in the building, but not to the City Rire Department, for fire drills During this test a regular alam will register from another station in case of tires. The system shall be electrically supervised against opens and grounds on both the station and signal devices withing trouble of this mature shall not cause a false alarm on the municipal system but shall cause a vibrating gong to ring at the control panel usible such trouble is corrected. The system shall be designed for operation on 120 volts from 2 phases of a 208 volt, 3 phase, 4 wire, service. Stations and alarm devices together with all the necessary control relays shall operate from one line to neutral of this service, the trouble ball operating from the other line to neutral.

- O. The stations shall be of the following type: Edwards Ho.1275-2 MT, surface tripper type auxiliarized municipal box.
- D. Bells shall be Miwards No. 84 single stroke, underdome, solenoid type, size and location as shown. Finish of base, red.
- Ro The central panel shall be Edwards No. 1227 type T for connection to a tripper type auxiliarized municipal box, number of signal and station circuits as specified, designed to operate from 2 phases of a 3 phase, 4 wire service. It shall contain control relays, resistors, time limit cut-outs, fuses, terminals, and a milliammeter which shall be mounted in a red sheet steel cabinet surface or flush as specified, with hinged door, lock and key. There shall be furnished also, and mounted near the control panel, a system trouble bell, Edwards No. 551-T 120 volt vibrating type Cow Gongo

- F. A tripper type auxiliarized municipal type box of the same type ar, and to operate satisfactorily with, the municipal fire alarm system shall be furnished and installed as directed and as approved by local fire alarm authorities.
- G. The connection from the light and power service to the control panel shall be made on the house side of, and as near an possible to, the meter. All interior wiring shall be not less than No. 14 RAC gauge, rubber covered and braided, or N.E.C. approved equivalent, run in rigid iron conduit throughout, and as shown on the plans. All wiring shall be in strict accordance with NBFU pamphlet 72 requirements for an auxiliary system and local regulations applying.

5. AIR COMPITIONING PLANT TO LATER SWITCH

- A. Furnish, install and connect up a master isolating switch for the whole ventilating and air conditioning plant throughout the building. This switch, which shall be key operated for City Fire Department use, shall be located as indicated on drawings. It shall be arranged so that on being thrown all fam throughout the building are isolated.
 - B. Furnish four (4) keys in connection with this push button control.
- C. This push button to match push buttons as for other controls in same location.
- D. Switch to be mounted in approved pattern glass fronted wall case, red painted and marked "For Fire Department Use Only".

6 ICE RINK FLOOR CONDUITS

A. Farmish and install disting ice all loss web four (2) 10 conduits for wiring connections to the boxing ring, etc., as indicated on Drawings.

- B. General arrangement of the conduitr, wires and connectors to be as shown on drawings. Include for fluch mounting water tight floor boxes to details shown, approved manufacture and types.
- C. Conduits and wiring to terminate in nearest system how with conductors leaving sufficient free ends for aplicing by Mountain States Telephone & Telegraph Company. The P.A. system and Power wiring splices to be connected in those respective systems, as shown on the drawings. Conduit to be made water tight.

7. PAGING AND PADIO CONDUIT SYSTEMS

This Contractor shall install an empty consuit system to accommodate a two-way paging system. Also to be installed is an empty conduit system to be used for tie-in of broadcasting facilities with the Telephone network system. Both systems shall be as shown and detailed on the drawings, and the general requirements as covered for the telephone empty conduit system (1) shall apply also to these two systems.

B. COOTE NOATES

This Contractor shall include in his bid a lump sum of \$10,000 to cover the possible provision of two (2) Automatic Score Bourds with their controls, wiring, lights and connections, etc. These Bourds would be lung from the catwalk and wired to spare circuits available on the catwalk puncls.

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SECTION NO. 10 - DEDUCTIBLE ALTERNATIS AND UNIT PRICES

1. DEDUCTIBLE ALTERNATE NO. 1

- Omit (A) All wiring required in connection with supply fans #28S, 31S, 34S and 36F, including remote control wiring. Leave empty conduit.
 - (P) All wiring required in connection with well pump motors \$\(\ell\)1, 2, 3 and 4, including remote control wiring. Also one 2%5 amp breaker from each Power Panel PPH 1 to 4 in the Mezzanine Plant rooms. Replace breakers by space only. Leave empty conduit.
 - (C) All wiring, conduit and fixtures in well pump pits #1 and 2.

2. DEDUCTIBLE AUTHRNATE NO. 2

- Omit (A) All wiring and conduit required in connection with Refrigerating Compressor, Brine and Pump motors. Also breakers required for these motors and one complete switchgear compartment of the 500 KVA, 480 volt unit substation.
 - (B) All wiring and conduit required in connection with the Refrigerating Plant room supply and exhaust ventilating system.
 - (C) All wiring required in connection with Well pump motors #7 and 4, including remote control wiring. Also one 225 amp. breaker from each of power panels PPH 3 and 4 in the Mezzanine plant rooms. Replace breakers by space, only leave empty conduit.

DEDUCTIBLE ALTERNATE NO. 3

- Omit (A) Rine (9) lighting fixtures, type CC, as specified in SECTION NO. 7, Article 3 hereinbefore.
 - (B) One (1) lighting panel #LPAM and its feeder & sign light connection.
 - (C) All wiring required in connection with the above fixtures. Leave empty conduit.
 - (D) Provide and wire alternate fixtures as shown on drawings to replace type CC. Quit conduit extensions to type CC fixtures.
- 4. DEDUCTIBLE ALTERNATE NO. 4
- Omit Boxing floodlights, feeder and control, also frame structure, hoisting equipment, etc., as specified in SECTION NO. 6, Article 3 and 7 hereinbefore.

5. UNIT PRICES

- (A) Include in bid unit price per 10 ft length of HT cable as called for in SECTION NO. 4, Article 2
- (B) Include in bid unit price per string of temporary lighting as called for in SECTION NO. 1, Article 2.

CONTRACT NO. 5 - ICE RINK COMPLETE, INCLUDING REFRIGERATION AND RINK FLOOR CONSTRUCTION

SECTION NO. 1 - SPECIFIC REQUIREMENTS.

1. APPLICABILITY OF CONTRACT DOCUMENTS.

The Contract Documents shall be those defined as such in the Agreement. The "General Conditions Governing all Comtracts" shall apply to all work of this Contract.

.2. SCOPE

It is the intention of these Specifications and the accompanying plans to include all labor and materials to install completely and leave in full and proper working order to the entire satisfaction of the City and County of Denver the complete Ice Rink installation. This installation shall comprise:-

- A. Ammonia Refrigeration plant complete with compressors, motors, controllers, condensers, evaporators, all inter-connecting gas and liquid piping, etc:- and also condenser cooling water connections:-
- B. Brine Circulation system, surge & mixing tank, heater, circulating pumps motors and controllers, all inter-connecting pipe work and mains, floor coil headers and connections, floor coils, etc:-
- C. Floor Construction including coil supports, expansion joints and arrangements, insulation, concrete slabs, terraro finish etci-
- D: This Contractor shall be responsible for the entire work and shall correlate all sections to make a complete installation. All materials found necessary and desired, free from defects, new, and of makes specified and all labor necessary shall be provided complete for this installation.

3. WORK NOT INCLUDED

All electric wiring will be done by others. The Ice Rimk Contractor shall only furnish and set controllers and motors, and he shall furnish to the Electrical Contractor all necessary wiring diagrams for the connection of his apparatus.

4. STANDARD DEFINITIONS

As used hereinafter the following definitions and abbreviations shall apply:

- A.S.M.E. American Society of Mechanical Engineers
- A.S.R.E. American Society of Refrigerating Engineers

5. SPECIAL CONDITIONS

- A. It is the intention of these Specifications and the Drawings to call fer finished work, ready for operation and therefore any apparatus appliance or material not shown on Drawings but which is mentioned in the specifications or vice werea or anything which may be necessary to make the work complete and perfect in all respects and ready for operation, even if not particularly specified, shall be furnished delivered and installed by the Contractor the same as though specifically shown on Drawings or mentioned in the Specifications without any additional expense to the City and County of Denver.
- B. All materials and apparatus required for this work shall be new and shall be furnished, delivered, erected, connected and finished in every detail and the entire plant is to be tested, left complete and in perfect working order. All labor to be performed shall be carried cut in a thorough and workmanlike manner by skilled labor.
- C. All materials shall be delivered and erected in place with sufficient rapidity so that the work may be performed to complete the installations at the time set forth as the date of completion.
- D. All piping shown on plans is diagrammatic. Consult the Architect-Engineers detail Drawings and constructional drawings for actual spaces available and for building and ceiling details before installing pipes and apparatus. This Contractor shall cover such additional deviations from the plans as may become necessary to most the actual structural conditions and to accommodate apparatus installed by other parties, also minor alterations of work already installed to suit decoration and trim, any discrepancies in estimate reasurements made from plans, and any extra services, labor and materials not mentioned herein that may be necessary to comply with all laws and regulations of all departments having jurisdiction over this work.
- In This Contractor the lifernish all necessary templates, ratherns, for installing his work and for the purpose of taking adjoining work conforms. Also any dimensioned detailed sketches showing the size and construction of his apparatus and material as may be required by the Architect-Engineers. This contractor shall inform himself fully regarding peculiarities and limitations of space available for the installation of all his apparatus.
- F. This Contractor shall be responsible for the perfect operation of the entire work in this Contract and shall make good and repair without expense to the City and County of Denver any part of the work which is imperfect or which may become clogged or inoperative due to lack of protection during construction, to defective material or to poor workmanship. This Contractor shall see that all his equipment such as regulators, valves, dirt pockets, emptying cocks, vents, etc., which it may be necessary to reach at intervals for operation and maintenance purposes shall be fixed in fully accessible position.
- G. This Contractor is to protect and insure his own materials being responsible in every respect for all parts of the plans, whether paid for or not, until his work is completed, the apparatus accepted and left in charge of the City and County of Penver. Erect all sheds for storage of materials and provide temporary office for plans, details, records, etc:-

- H. This Contractor shall furnish the services of an experienced Superintendent who shall constantly be in charge of the installation of the work, tegether with all necessary skilled workmen, helpers, fitters, welders and labor required to properly unload, transfer, erect and connect up, adjust, start, operate and test the systems.
- I. Where no specific kind or quality of material is given, a first class standard article as approved by the Architect-Engineers shall be furnished.
- J. This Contractor shall furnish all scaffolding, rigging, etc: and such equipment required in connection with the installation of his work.
- K. Small details not usually shown or specified but necessary for the proper installation and finishing shall be included in the Contractor's estimate, the same as if herein specified or shown.

6. CODE RULES AND PERMITS

- A. All work and materials shall be installed in full accordance with all laws and regulations having jurisdiction and this Contractor shall secure all necessary permits, pay all fees, etc:- to this end.
- B. This Contractor shall include in his work, without extra cost to the City and County of Denver any additional materials or apparatus required but not shown on the Drawings or specified, to meet the laws and regulations.
- C. The entire installation shall be carried out in accordance with the requirements of the National Board of Fire Underwriters.

7. DETAIL DRAWINGS

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- This Contractor shall furnish all necessary templates, patterns, etc., for installing his work and for the purpose of making adhoing work conform and he shall furnish setting plans and shop details for all branches of the work as required. Where said Drawings are approved by the Architect-Engineers, said approval does not mean that said Drawings have been checked in detail and said approval does not in any way relieve the Contractor from the responsibility nor necessity of furnishing material or performing work required by the Contract Drawings and Specifications.
- B. This Contractor shall furnish for approval detail dimensioned Drawings showing the construction, size, arrangements, etc. Vall apparatus, specialties, etc., which he proposes to furnish and such other detail information concerning which the Architect-Engineers may desire detailed information or which may be required for the building construction. Number of copies of Drawings submitted to be as required.
- C. This Contractor shall submit a list of materials giving manufacturer and figure, numbers for the approval of the Architect-Engineers. This Contractor's desire to use materials of manufacture given hereinafter does not relieve him of submitting a list.

8. CUTTING AND PATCHING

- A. The General Contractor is to provide the necessary chases, shafts, and trenches for this Contractors services where required. Chases etc:- are to be located by this Contractor, who is to determine the size and location as desired, and if this Contractor does not supply the proper information to the General Contractor, he is to pay for making the necessary changes or corrections.
- B. This Contractor is to furnish to the General Contractor the necessary sleeves which are to be built in masonry walls. The exact height and location of these sleeves are to be determined by this Contractor.
- C. If, after the General Contractor has made any openings at the request of this Contractor, the Contractor decides to change the locations of such openings, he shall pay the General Contractor for doing the additional work.
- D. All holes out through concrete arches shall be punched or drilled from the underside.

9. FOUNDATIONS AND FIERS.

All foundations and piers required for the installation or support of apparatus furnished under this Contract shall be furnished by this Contractor. *He shall furnish necessary foundations or supports under compressors, condensers, evaporators, pumps, tanks, headers, etc:—and similar apparatus.

10. TESTS

- A. This Contractor is to test all materials, apparatus, specialties, etc:furnished or installed under this Contract to see that they operate properly and
 quietly and that they are free from defects. Test all motors and controls and
 leavesthem in satisfactory working condition.
- B. The entire Refrigeration Cycle and Brine Circulating System is to be completely tested under full operating conditions and left in complete working order. In connection with this test, a full working test of the Ice Rink freezing, with flooding of water to normal depth on the Rink, etc:— and all normal operating conditions simulated is to be carried out. This test shall cover both freezing and maintaining of the Rink, the latter to be performed for a period of not less than 72 hours. All required time, temperature, etc:— records are to be maintained during this test and complete record of the test is to be submitted on completion, to the City and County of Denver and the Architect-Engineers.
- C. In connection with these tests furnish all necessary skilled labor for plant operation, adjustment and observation, etc:-
- D. Provide all necessary skilled labor for operating entire plant for a period of two weeks after completion of tests, for instruction of the City and Aounty of Denver.
- E. Include cost of all necessary electric current for carrying out all these tests.

11. GUARANTER

- A. This Contractor shall guarantee to at his own expense, replace or repair promptly any workmanship or materials in which defects may develop within one (1) year from date of final acceptance of his work.
- B. Where such defects occur, this Contractor shall be held responsible for all costs incurred in making the defective work good and all injuries to plaster, wood or other finish caused by such replacements and repairs of defective work shall be replaced and repaired in first class condition by this Contractor at his own expense.

C.This Contractor shall furnish certificates of guarantee from the manufacturer of specialties and apparatus furnished under this Contract to the effect that they will furnish new parts or apparatus where defects occur due to faulty manufacture, for a period of one year from date of final acceptance.

D. This Contractor shall also give a five (5) year performance guarantee covering the floor construction and operation. This guarantee shall apply to the floor slab proper, including embedded coils, supports, etc:- expansion joints and waterproofing and insulation.

12. RECORD DRAWINGS -

- A. This Contractor shall keep a complete and accurate record of all deviations in their location of all pipes, pipe sizes, etc., from the Contract Drawings, as well as all pipes laid under floors or not shown on the Drawings; and shall on the completion of the work, furnish one set of ink on cloth tracings showing the exact location of all pipes, control valves, specialties, etc:-
- B. In the preparation of these tracings, the Contractor may make use of highestaph prints of the least banks and contract Description of the least banks as Contract Description of the use of the least banks as Description of the use of the least banks as the least of the least
- C. Also prepare framed charts located in plant room showing diagrammatic arrangement of operation of all systems, including full lubrication and operational instruction charts with controls properly indicated in all cases. Three copies of such charts and instructions to be provided.

13. COST OF TEMPORARY SHRVICES

This Contractor shall include his proportionate share of the expense for water, electricity, heat, telephone and disposal of rubbish, etc:- used during the entire period of his Contract as may be agreed upon between the Contractor for Contract No. 1 and this Contractor.

14. PAINTING

This Contractor shall paint all exposed equipment and piping upon completeion of installation. Fairs used and coats given shall conform to the requirements of CONTRICT NO. 1 SECTION 20-PAINTING, for the corresponding surfaces.

SECTION NO. 2 - MATERIALS

- A. This Section of the Specification deals with materials to be used in General. For particulars of use of materials in individual systems see sundry headings as well as below.
- B. All materials and equipment furnished and installed under this Contract shall be new and of the best quality of the kind specified and shall be free from defects of any character. All workmanship shall be first class and subject to the approval of the Architect-Engineers.
- C. The manufacturer's name or trade mark shall be stamped or cast on all pipe and fittings which shall be marked for gauge and weight.

1. PIPE

- As All piping used shall be either extra heavy or standard weight, black mild steel as made by National Tube Co., Bethlehem Steel Co. or equal approved. Where specified "Rayduct" steel pipe as manufactured by Bethlehem Steel Co. extra heavy weight, shall be used. Cast iron pile shall be sound smooth gray iron, free from cracks and holes and other defects. To be of extra heavy grade as manufactured by Alabama Pipe Co., Central Foundry Co., Essex Foundry, or equal. Pipe to be marked with makers trade name and weight of pipe.
 - B. Where required for welding all pipe shall be delivered mill beveled.

2. FITTINGS

- A. Fittings for the Refrigeration Cycle ripe work i.e. all piping carrying armonia gas or liquid, etc., shall be Voyhts Armonia pattern, acrewed or clarged or equal approved.
- B) Utblings for the Brane Carculation system shall be standard on office nearly weight, welding patternias manufactured by Tube Turns Inc., or equal: where screwed fittings are required they shall be extra heavy steel of standard design.

5. JOINTS

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- A. For the Refrigeration Cykle jpints shall be flanged with asbestos composition gaskets to Voghts standard or equal approved. Flanges shall be acrewed on pring and back welded.
- The For the Brine Circulation all joints shall be welded throughout except where screwed or flanged valves, specialties, etc., are used. All welding shall be done by men skilled in this particular line of work. All welded joints shall be made by the oxyscetaylane process. All pipe 2" or over may be purchased mill beveled, or shall be machine beveled on both ends before being welded. On odd lengths of steel pipe, beveling may be accomplished by the use of the Oxacetylane cutting torch, provised all scale and oxide are removed with a hammer and chisel or file. The width and reinforcement of welded joints shall be as approved. The welded metal shall be thoroughly fused with the base steel metal at all sections of the weld, and the penetration of the weld shall include the unbeveled portion and extend to inside walls of the pipe. All peale, rust, or other foreign matter, shall be thoroughly removed from the ends of the pipe lengths before tacking and welding. The pipe lengths shall be lined up straight, and the abutting pipe ends shall be concentric. The spacing and tack welding

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shall be used/as to prevent the pipe from lapping or getting out of alignment during the welding operation. All welds shall be made in a first-class work-manlike manner. For steel pipe welds, high test welding rod, equal to Oxweld No. 1-A, or its approved equivalent, shall be used.

C. Where screwed joints are used in the Brine Circulation they shall be made up iron to iron with litherge and glycerine. Flanged joints shall be made with asbestos composition gaskets.

4. VALVE'S AND TAGS

- A. For Refrigeration Cycle valves shall be Voght standard or equal approved, served or flanged as required.
- B. For the Brine Circulation system valves shall be standard 125 lb. cast iron or bronze body with steel seats, globe pattern, flanged or screwed as required.
- C. All valves shall have hand wheels and shall be properly packed and left drip tight.
- D. This Contractor shall equip each valve with the proper size brass tag, secured to the valve wheel by brass links. This tag, is to be numbered or lettered and the Contractor shall prepare a triplicate schedule tabulating valve numbers and designating the line or apparatus controlled by the valve. Two of these schedules shall be framed under glass and placed as directed by the City and County of Denver.

5. MATCHING OF FITTINGS

In connection with the Refrigeration Cycle, it shall be specially noted that only one manufacturers associal pattern fittings, valves and specialties shall be used throughout to avoid the risk of non-materials.

6. SLYEVES

This Contractor shall furnish and install pipe sleeves for all free standing lines passing through floors, walls partitions, furring, and foundations. Sleeves for building walls, where constructed of brick, stone, tile, or cement, shall be wrought iron. These sleeves are to be cut the proper length to extend the full thickness of the wall or partition, including the finish. These are to be of size to allow pipe covering to pass through. For all limes passing through floor slabe, or collings, furring, or thin partitions, this Comtractor shall furnish and set #20 gauge galvanized iron sleeves, of the full thiskness of construction, finish to finish. There pipes pass through furred beilings, the sleeves shall be of full length extending from finished floor surface above to the bottom of finished ceilings below or similar construction. Contractor is to use the utmose care in properly aligning the pipe sleeves, and sleeves shall be of sufficient diameter to allow for the movement of the pipes and connection without causing damage to the building construction or plaster finish. Where pipes are not to be equipped to pipe covering, and at all entrance or exit points through floors, ceilings, walls, partitions, or furring, this Contractor shall furnish and set

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7. HANGERS, BRACKETS AND SUPPORTS

This Contractor shall furnish and set all required pipe hangers and supports for the proper support of all piping installed by him. All hangers for horizontal piping shall be provided with beam clamps or inserts in concrete or 4" x 4" plates with muts where hangers pass through floor or ceiling or as otherwise approved. Hangers are to be malleable iron split hangers. Clip-Bar-Grinnell -Orabler or equal as approved. Where several lines of piping are run in a common location, they are to be supported by adjustable hangers with a common bar or pipe. All pipe shall be properly anchored and braced as may be necessary. This Contractor shall furnish and install all such necessary anchors and bracings. All hangers shall be put up straight and true and in perfect alignment and no hanger shall be placed near couplings. Hangers for pipes 12" and smaller to be spaced approximately 7 ft. on centers. For pipes 2" and over, the hangers are to be spaced approximately 13 ft. on centers. On all main lines 12" and amaller where there is a 90 or 45 degree bend, a hanger shall be placed approximately 1 ft. away from this bend on either side. Furnish and install all required floor or wall standards with bracket plates and wall clips and other required steel work for the support of the various materials and apparatus furnished under this Contract. Include for angle or channel supporting frames for emsporators and condensers.

8. VENTS

Furnish and install all necessary vents with cocks and valves, including discharge from these to locations as required. Vent cocks and valves to be standard 125 lb. pattern, bronze body with hand wheels.

9. INSULATION

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B. Covering for fittings, valve bodies, specialties, etc., shall be of same general type as specified for pipework and shall comprise specially moulded sections to fit the particular appliance.

Co Finish covering as follows:

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Apparatus or Pipework

Brine Circulation Pipework including purge header, but excluding vent lines.

Method of Covering

Fosmglas insulation 12" thick as manufactured by Pittsburgh Corning Corp. or equal. To be held in place by closed type menel bands 3/8" wide x .015" thick as menu-factured by Acme Steel Corp. or Republic Steel Corp.

Foamglas insulation as shown. The flanged head of the heater shall be covered in such a manner that its removal will not require destruction of any of the shell insulation.

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Brine Heater

Brine cooler and Surge Tank

Foamglass insulation as above, except that all joints shall be filled with hot asphalt. Removal of cooler heads and Tank manhole shall be arranged as indicated for heater above.

Brine Pumps

Poamglass insulation as above, but this to be encased in Transite cover with removable top for pump access. Foamglas to be sealed with hot asphalt.

Inter Cooler liquid Lines and Liquid Receiver

Foamglas insulation as above with metal holding bands having hot asphalt sealed joints.

P. All pipe work and surfaces to be covered shall be thoroughly cleaked and wire bushed, with all rust removed and properly dry before any insulation is applied.

E. For all supported apparatus, furnish and install proper blocks of insuleteing material under sadelles and brackets, etc.

SECTION NO. 3 - BRINE CIRCULATION SYSTEM

1. GHN KRAL

This Contractor shall furnish and install complete the Brine Circulation System required in connection with the Ice Rink. This system shall include the brine heater, circulating pumps, all circulating pipe work, fittings, etc., supply, return and purge headers, vent, connections to rink coils, the rink coils with supports, make up and surge tank, etc., together with all fixings, supports, insulation and necessary accessories, all as indicated on Drawings and specified herein.

2. TYPE OF PIPE AND FITTINGS

For all pipe work, including rink coils, use extra heavy steel pipe with extra heavy screwed or welding fittings as specified hereinbefore.

3. MAKE UP AND SURGE TANK

Furnish and install one combined make/and surge tank, 4.4 diameter x 6. high, 650 gallon operating caracity. Tank to be of 5/16 minimum thickness steel all well-deconstruction and to have one 8 standard flanged inlet nozzle and one 8 standard flanged outlet nozzle, one 18 standard manhole and one capped nozzle in head for measuring rod.

4. BRINE HEATER

Furnish and install a 90 sq.ft. heating surface brine heater similar to the Patterson and Kelly II tube No-freeze type to be capable of passing 1,000 follows for municipal below to the passing 1,000 follows for municipal below to the passing 1,000 follows for municipal below to the passing 1,000 follows follows to be passing 1,000 follows follows to the passing to the passing to the passing to the standard transfer and for steam pressure gauge of approved manufacture. Also cast from saddles and necessary supports.

5. BRINE CIRCULATING PUMPS

A. Furnish and install two brine circulating pumps, each having a capacity of 1,000 G.P.M. when pumping brine at a specific gravity of 1.191 through a pressure drop of 50° plus the drop through the cooler. They shall be of the non everloading type similar or equal to those manufactured by the Worthington Pump Co.

B. In connection with each of these pumps, and wounted on common base plate, with it furnish and install a direct drive 50 HP squirral cage motor of type manufactured by General Electric, Westinghouse, or equal approved. Pump and motor to be connected with flaxible coupling. Starters shall be reduced voltage, combination magnetic type push button operated and shall be located as indicated on the Drawings.

6. HEAD RS AND COIL CONNECTIONS

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Furnish and install the supply, return and purge headers complete with all piping connections, valves, vents, supports, fixings, insulation, etc., to details shown on Drawings.

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7. FLOOR COILS

Furnish and install complete with supports, all ice rink coils to general details sown on Drawings. Coils to be of hairpin type constructed of "Rayduct" extra heavy line diameter black steel pie bent to 4" centers as hereinbefore specified. All joints in coils to be welded throughout and coils may be factory manufactured if so desired.

- B. Before any embedment of any coils is carried out, each coil shall be tested hydraulically to a pressure of 200 p.s.i. maintained for a continuus period of two hours. This test shall be witnessed and approved for each coil by a representative of the Architect-Engineers. If any leaks develope the shall be repaired and the faulty coil completely retested to the entire approval of the Architect-Engineers representative.
- C. All coils shall be laid dead level in both directions and shall be properly and adequately supported known permanently and, if required, additionally temporarily during the casting process, to ensure this

SECTION NO. 4 - REPRIGERATION PLANT

1. GENERAL

- A. This Contractor shall furnish and install the refrigeration plant required in connection with the Ice Rink, including compressors with their motors and comtrollers, condensers, and coolers, gas and liquid pips work, condenser cooling connections, lubrication pipe work with all required accessories, insulation, valves, fittings, specialties, supports and fixings, etc., all as called for on Drawings and herein specified to complete a full working installation.
 - B. Include for all tests and operation of the plant as herein before specified.

2. PIPE AND FITTINGS

- A. For all gas Ammonia lines use extra heavy weight black steel pipe. For all liquid Ammonia lines use standard weight black steel pipe.
- B. For all Refrigeration cycle fittings, etc., use Voght Ammonia Pattern as herein before specified.
- C. For condenser cooling water lines, use cast-iron flanged pipe and fittings as herein before specified.
- D. Leave blanked Tee connections for future additional compressor as noted on Drawings.

3. COMPRESSORS

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- B. Each compressor shall be furnished and installed as indicated on the plans and shall be complete with the necessary accessories, such as oil level sight, gauge, force feed lubrication system, oil return check valves in the cylinder block, etc. An oil separator shall be provided in the discharge line of each compressor with a drain back to the crank case. The shaft seals shall be of the semi metalic packing type. One capacity reducing bypass shall be supplied for one of the 76 ton compressors and one for the 55 ton compressor. Each compressor to be provided with 6" disfieter pressure gauge on discharge and suction and 8" Industrial type thermomenters.
- C. This Contractor shall furnish the initial charge of Ammonia for each system also the initial oil charge for each compressor and one oil recharge which shall be made after the system has been tested.

4. MOTORS AND CONTROLLERS

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A. Driving motors for the compressors to be squirrel cage and shall be high starting torque, low starting current of 440 volt, 3 phase, 60 cycle and mounted on slide rails.

- B. This Contractor shall also furnish and install starters and bush button controls, located as indicated on the Drawings. Starters shall be reduced voltage combination magnetic type push button operated.
- C. In connection with the motors furnish and install Vee Belt drives for suitable speed reduction between motors and compressors. Furnish and install machinery guards for these drives. To be of open wire mesh type, galvanized with proper stiffening angles and all required supports and fixings.
- D. Furnish all necessary foundation bolts for compressors and motors and include for necessary foundations as herein before specified.

5. CONDENSERS

A. This Contractor shall furnish and install the necessary condensers located as indicated on the Drawings. The condensers shall be of the shall and tube type and shall be of sufficient capacity to balance the compressors at the conditions specified when supplied with cooling water at a temperature of 55 F and to be of type and quality equal to that manufactured by the York Corp.

Bo Furnish all supporting cradles and steel work required for the condensers as indicated on the Drawings.

6. CONDENSER COOLING CONNECTIONS

- A. Furnish and install the required condenser cooling water connections.
- B. The supply connections shall be brought from a blanked Tee left by others against the pump discharge head on well pumps #2 & 3, as indicated on Drawings. Include for isolating valves at the pump connection.
-), ক্রিট (Nedhargo connections Arrell or taken to the storm water dender ক্রেমার বার ইন্টেইবেরিট জা ইন্টেম্ট্রেট
- D. All this pipe work shall be carried out in flanged cast-iron pipe and fittings as specified herein-before. Include all hangers and fixings, valves, specialties, fittings, etc., as required. Also 8" industrial type thermometers at supply and discharge connection of each condenser.

7. LIQUID RECKIVER

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Furnish and install one separately mounted liquid receiver of sufficient capacity to hold the entire charge of ammonia for all the system, for the purpose of pump down.

8. BRINE COOLER

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- A. This Contractor shall provide and install two shall and tube type brine coolers capable of cooling a total of 2,000 G.P.M. of brine from an initial temperature of 18°F. to a leaving temperature of 15°F. when the suction pressure is 25# gauge. Coolers shall be furnished complete with brine valves, relief valves, automatic float controls, complete with three valve hand expansion by passes.
- B. Include all necessary supporting frames and saddles. Also industrial type 8" thermometers on brine feed and discharge connections.

SECTION NO. 5 - FLOOR CONSTRUCTION

1. GENERAL

- A. This Contractor shall furnish and install the Arena ice floor complete with all insulations, water proofing, joints, pipe coil supports, etc:- to general details indicated on Drawings.
 - B. The foundation base slab shall be provided and east in place by others.

2. CONCRETE SLAB

- A. Furnish and install complete the 5" thick concrete slab. Materials, firish and workmanship for this shall conform to the Specification conditions indicated under CONTRACT NO. 1, SECTION 3 - CONCEPTE. Incorporated the various inserts, etc:- as specified hereinafter.
 - B. The ice rink floor shall be of Type A Concrete.
- C. The concrete shall be of comparatively dry consistency and shall be screeded level. After compacting, the surface shall be prepared to receive the required type of finish treatment specified.
 - D. The ide rink floor shall be given a one (1) inch intergral finish.
 - E. The mix shall be as follows:

Portland Cement Aggregate

1 Part 3 Parts

Water

47 Gallons per sack cement

The After all surface water has disappeared from the floor, but while him something in the first surface water has been such as the surface of the surface water and surface water w required level, floated with mechanical floats of a design approved by the Architect-Engineers, and steel troweled smooth. No floating or troweling shall be done until all water sheen has disappeared. After the finish has set sufficiently to ring under the trowel, the work shall be given a second troweling to produce a burnished surface.

- G. The method of operating the power float and finisher shall conform strictly to the manufacturer's directions.
- H. After the finishing is completed, the surface of the floor must be dead level.

3. SUFFORTS FOR COMES

Furnish and install for support of coils continuous ber chairs of type called for under COMTR'CT NO.1. SECTION 3 - CONCRETE at not greater than 4' conters. These shall be wired to the pipe coils to firmly position them during pouring of the slab.

4. INSERTS

Install the various barrier supporting inserts and alceves as furnished by others. For details and positioning of these see Cantract NO. 1, SECTION 12 and corresponding Drawings.

5. EXPANSION JUINTS

- A. The whole upper 5" concrete slab shall be arranged so as to be capable of laterial expansion and contraction without damage to itself or the surrounding structure. It shall therefore be provided with horizontal and vertical expansion joints as required.
- B. The main horizontal expansion joint under the slab may be of the metal type, incorporating maitable type metal sheet layers arranged to give free movement of the slab above.
- O. For the 1" vertical expansion joints use preformed expansion joint filler which shall conform to the tentative revision of ASTM-0544 Specification for Type 5, bituminous fiber. A metal expansion dam shall be incorporated in these joints, but shall be furnished and installed by others.

6. WATEPPROOF MANBRANZ

Directly over the horizontal expansion joint, as indicated on Drawings, furnish and install a waterproof membrane consisting of two mies of coal-tarpitch satuarated fabric weighting not less than 15 lis. per 100 sq. ft. with three heavy moppings of coal-tar-pitch applied after the fabric is laid.

7. INSULATION

Firmula and instant and insulation as Toured for the Short and as indicated on Drawings, the general this shall so poles which of 27 think compressed machinery cork, the lasulations shall be bedded properly and all joints shall butt tightly. It shall be arranged to present an even unbroken surface for the application of the expansion joints. Each separate layer shall be mopped with hot asphalt to fill all joints and cover the cork surface.

8. PATENTS

- A. The intent of the floor specification given above, together with details shown on Drawings is to set a standard for construction etc:— It is not intended that this construction must necessarily be rigidly adhered to, nor that the details given shall usurp any particular design patents.
- B. If he so chooses this Contractor may allow in his bid for a patented floor construction. However in this case he shall include all fees, patent charges, service charges, etc:— by the pantentees, in his bid and none of these shall be allowable as extra's to the Contract. In addition in submitting his bid he shall indicate the name of the patentee whose floor he proposes to use. Further no responsibility for the use of the patents, nor for any disputes which may arise in connection with them shall attach to the Architect—Angineers or City and County of Denvero

- O. In this event Articles 2 through 7 may be considered void in their details although not in the general intent of the Specifications. However this shall only apply if a standard recognized long established type of patented floor be allowed for which meets the Architect—Angineers approval.
- D. In any event regardless of the construction finally approved and agreed upon, it shall be the entire responsibility of this Contractor to fully safeguard the City and County of Denver and the Architect-Engineers against any disputes or claims which may arise in connection with any ice rink floor patents.

9. CONSTRUCTION APPROVAL

Before any actual construction of the floor is commenced this Contractor shall submit for the Architect-Engineers approval full detail working Drawings covering all phases of the actual construction he proposes to use. Any details shown which are disproved shall be corrected to the Architect-Engineers approval.

CONTRACT NO. 6 - WALLS AND PUMPING ALUTHMENT

SECTION NO. 1 - SPACIFIC REQUIREMENTS

1. APPLICABILITY OF CONTRACT DOCUMENTS

The Contract Documents shall be those defined as such in the Agreement. The "General Conditions Coverning All Contracts" shall apply to all work of this Contract.

2. SCOPE

It is the intention of these Specifications and the accompanying plans to include all labor and materials to install completely and leave in full and proper working order to the complete satisfaction of the City and County of Denver the following systems as shown on Drawings and nerein called for:-

- A. This Contractor shall explore, drill test, wells and guarantee two wells of a minimum capacity of 200 G.F.M. each at the western end of the Stadium as indicated on the plans; he shall guarantee the City and Courty of Denver that the draw down from these wells will not affect existing wells in the immediate vicinity and shall accept all liability therefrom.
 - B. Also provide two wells located at a minimum distance of 150 ft. east of the above two wells as indicated on the Drawings, all conditions as above and hereinafter mentioned pertaining.

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All electric wiring will be done by others. The Well Contractor shall only furnish and set controllers and motors, and he shall furnish to the Electrical Contractor all necessary wiring diagrams for the connection of his apparatus.

4. SPECIAL CONDITIONS

It is the intention of these Specifications and the Drawings to call for finished work, ready for operation and therefore any apparatus appliance or material not shown on Drawings but which is mentioned in the Specifications or vice versa or anything which may be necessary to make the work complete and perfect in all respects and ready for operation, even if not particularly specified, shall be furnished delivered and installed by the Contractor the same as though specifically shown on Drawings or mentioned in the Specifications without any additional expense to the City and County of Denver.

- All materials and opporatus required for this worm shall be new and shall be furnished, delivered, erected, connected and finished in every detail and the entire plant is to be tested, left condete and in perform and order. All labor to be performed shall be carried out in a thorough and work manner by skilled labor. All materials shall be delivered and erected in place with sufficient rapidity so that the work may be performed to complete the installations at the time set forth as the date of a applicable.
- O. This Contractor shall furnish all necessary templates, patterns, for installing his work and for the purpose of making adjoining work conform. Also any dimensioned detailed ske chas showing the size and construction of his apparatus and material as may be required by the Architect-Whillness. This Contractor shall inform himself fully regarding peculiarities and limitations of space available for the installation of all his apparatus.
- P. This Contractor shall be responsible for the perfect operation of the entire work in this Contract and shall make good and repair without expense to the City and County of Denver any part of the work which is imperfect or which may become clossed or inc; enative due to lack of protection during construction, to defective material or to poor workmanship.
- B. This Contractor is to protect and insure his two materials being responsible in every respect for all parts of the plans, whether paid for or not, until his work is completed, the apparatus accepted and left is charge of the City and County of Denver. Areat all sheds for storage of materials and provide temporary office for plans, details, records etc:-
- F. This Contractor shall furnish the services f an experienced Superintendent who shall constantly be in cherge of the installation of the walls and equipment and associated work together with all necessary skilled workment to the services of the installation of the walls and equipment and associated work together with all necessary skilled workment.

. for the installation of his work, also paint all exposed equipment two coass.

5. CODE RULES AND PERSITS

- A. All work and materials shall be installed in full accordance with all laws and regulations having jurisilation and this Contractor shall recure all necessary permits, pay all fees ato: to this end.
- This Contractor shall include in his work, without extra cost to the City and County of Dany r, any additional materials or appearatus required but not shown on the Drawings or appearable, to meet the laws and regulations.

6. FULLDAPTUNS

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All foundations required for the installation or support of appropriation furnished under this Contract shall be furnished by this Contractors

7. CUARANTEE AND TESTS

- A. This Contractor shell test all of the above equipment operating all of the pumps simultaneously to maximum capacity until draw down is static and shall turn same over to the City and County of Denver in satisfactory operating condition and untill accepted by the City and County of Denver this Contract shall be deemed incomplete.
- B. This Contractor shall guarantee to, at his own expense, replace or repair promptly any workmanship or materials in which defects may develop within one (1) year from date of final acceptance of his work.
- Co. Where such defects occur, this Contractor shall be held responsible for all costs incurred in making the defective work good and all injuries to plaster, wood or other finish caused by such replacements and repairs of defective work shall be replaced and repaired in first class condition by this Contractor at his own ex ease.
- Do. This Contractor shall furnish certificates of guarantes from the manufacturer of specialties furnished under this contract to the effect that they will furnish new parts or apparatus where defects occur due to faulty manufacture, for a period of one year from date of final acceptance.

8. COST OF THIROTARY . SRVECES

This Contractor shall include his proporticuate share of the expense for water, electricity, heat, telephone and disposal of rubbish sto: weed during the entire period of his Contract as may be agreed upon between the Contractor for Centract No. 1 and this Contractor. Include also all cost of electricity etc: for testing purposes.

SECTION NO. 2 - WELL BORES AND PUMPS

1. WELL BORES

- A. This Contractor shall sink the necessary shafts which shall be of concrete construction approximately 48" inside diameter. Wall thickness of concrete shaft to be suitable for ground conditions, depth of drill etc:-
- B. Include all required excavation etc:— as may be needed in connection with this drilling. In this connection excavation to well head levels will be done by others. Also concrete floor mate at well head level will be provided by others.

2. PUMPS, MOTORS AND CONTROLLE'S

- A. This Contractor shall provide and set in place the required turbine pumps complete with motors, starters and push buttons. The pumps shall be Water Lubricated Deep Well Turbine pumps as manufacture by the Deming Co. of Salem, Chio or approved equal.
- B. The column pipe to be copper bearing steel in lengths of not over $100^{4}-0^{4}$. The pump drive shaft to have stainless steel or monel sleeves at the stuffing box and bearings.
- 0. Bearings to be spaced not greater than 10 ft. spart, shaft to be in lengths not over 10 ft. and to have a alcove type coupling at the motor. Strainer to be brass of the basket type.
- The pumps shall deliver a minimum of 300 G.P.M. sech against a discharge
- 208 volt, 3 phase, 60 cycle. Starters shall be combination magnetic type mounted alongside the pumps and operated by remote control push buttons located as shown on the Drawings. Button; control to be Westinghouse type No-1033439 or equal.
- Fo This Contractor shall supply in place all equipment up to the discharge flange with counter flange on the pumps.
- G. Pump foundations, as hereinbefore required shall be furnished on the concrete floor mats provided at the well head by others.

3. CHROAICAL FEED

Furnish and install one self contained chemical feeder similar to Simplex Chem-O-Feeder Model 1-47 complete with 1/6 HP, 110 volt, 60 cycle motor. The motor to be started and stopped automatically from a starting relay directly connected to the well pump motor starter. The following accessories to be included:-

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- 1 15 foot length of R-15 tubing
- 1 injection nozzle check valve
- 1 combination foot where and strainer
- 1 year's supply of spare parts consisting of
 - 1 reagent diaphragm
 - 6 spare check walve tits
 - 1 check valve cap gasket
 - 2 check valve socket washers
 - 2 check valve nut washers
 - 1 valve disc washer
 - 1 adjustable gage
 - 2 Allen wrenches
 - 2 tube flaring mipples
 - 30 gallon crock for reagent solution

TO:

MAYOR NEWTON

FROM:

ED SMITH

DATE:

OCTOBER 3, 1947

Went over the proposed location of the new stockyards stadium with Mr. Pritchard, and Mr. Kane.

We agreed that the best location would be South and East of the present stadium; the building to be set 75 to 100 feet south of 46th Avenue and adjacent to the southwest line of 44th Street. 44th Street to be left open.

E.a. s.

City Engineer

DW

ENGINEERING & SURVEY the Title

March 31, 1948

MENO RANDUM

TOR

Mr. Thomas P. Campbell Manager Improvements and Parks

Mr. Ed Smith, Chief Engineer Improvements and Parks

Mr. Charles N. Haines Assistant City Attorney

FROM:

Mr. J. Glenn Donaldson City Attorney

SUBJECT:

Land Acquisition - Proposed 46th Avenue Development.

It is my understanding that the Evans property lies North of 47th Avenue but that the City owns tax titles on lands to the South abutting on 46th Avenue.

Rusty James of the Bureau of Public Roads 'phoned today to caution us to reserve 150 feet North of the center line of 46th Avenue for future highway needs in the event the City does control and make sale of this land. He states that 150 feet has been reserved South of the Center line of 46th Avenue along property recently acquired by Safeway Stores. A 300 foot right-of-way is contemplated at this point.

JOD:NPE